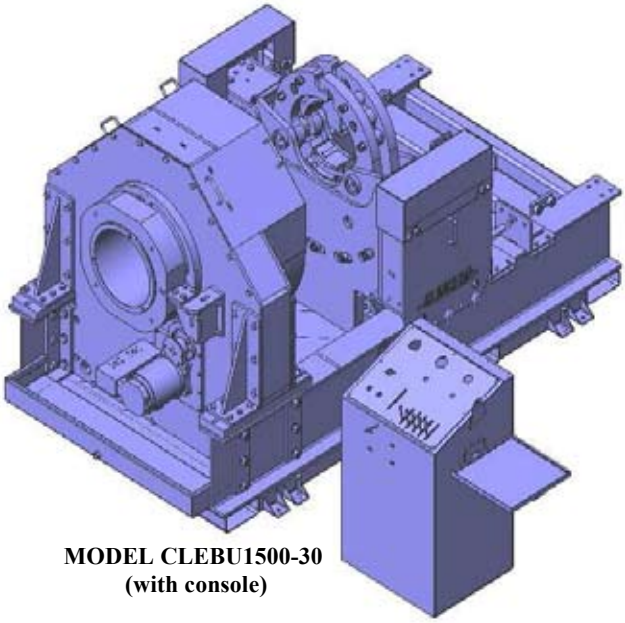
SUPERIOR
Manufacturing & Hydraulics

Technical Manual

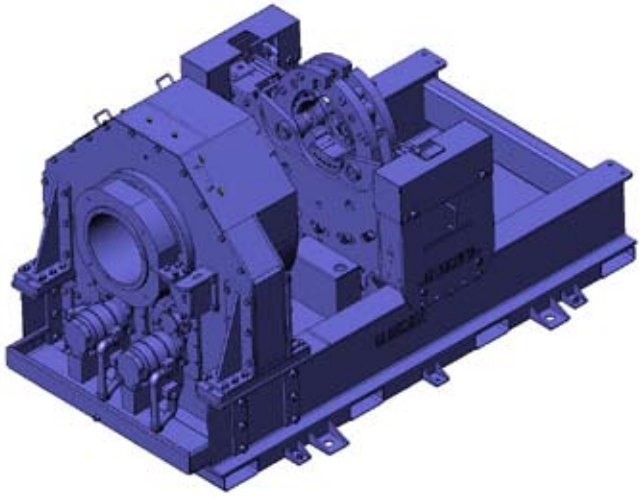
15" CLINCHER®

TYPE 3 BUCKING UNIT

Model Numbers CLEBU1500-30 & -32



MODEL CLEBU1500-30
(with console)



MODEL CLEBU1500-32

CLINCHER Electrically Driven Hydraulic Power Unit

Model PU7560
1800 RPM, 60 Hz, 75 HP, 3000 PSI, 60 GPM

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HAZARD WARNING

Nomenclature used in this manual:

WARNING Concerns an operating procedure or practice that, if not strictly observed, can result in injury to personnel or loss of life.

Caution Concerns an operating procedure or practice that, if not strictly observed, can result in damage to or destruction of equipment.

Note Concerns an operating procedure or practice that needs highlighting.

CLINCHER® Bucking Units are manufactured to provide a means of making up or breaking out high torque tubular connections. They utilize high pressure hydraulic fluid power which can cause the unit to move suddenly and with great force if not properly anchored. The pipe can also move when the unit is not anchored and if the pipe is bent or is not adequately supported. **CLINCHER®** Bucking Units contain rotating and reciprocating parts which can severely or fatally injure personnel who are operating, repairing, or near this equipment during its operation.

WARNING: Bucking Units and Power Units must be maintained and operated by trained personnel. Personnel with diminished physical or mental capacity must not operate this equipment. No work of any type, including changing of dies, is to be carried out while the Bucking Unit is connected to the Hydraulic Power Unit.

CLINCHER® Bucking Units and Hydraulic Power Units utilize high pressure hydraulic fluids. Portions of the unit, control valves, hydraulic lines and cylinders may contain high pressure fluid even when the Power Unit is de-energized and the fluid supply hoses are disconnected. During normal operation the temperature of the hydraulic fluids as well as hoses, piping, valves, etc., can rise to a level which can cause burns.

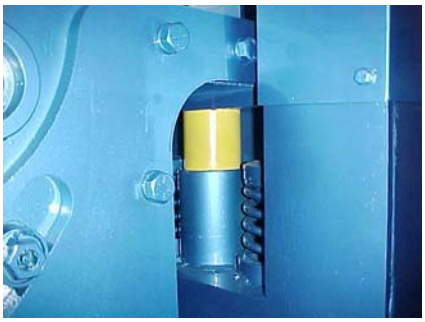
WARNING: Personal protective gear including safety glasses, face shields, protective gloves and protective clothing must be worn to guard against the hazards of high pressure fluids. Tight fitting clothing is required to prevent entanglement in rotating components. These units should be serviced by thoroughly trained and qualified hydraulic technicians using procedures to safely insure hydraulic pressure is bled from these circuits.

No attempt should be made to operate the **CLINCHER®** Bucking Unit for any purpose other than which it is intended. This system is capable of generating very large clamping forces and torsional loads which, if improperly applied or controlled, could result in damage to the tubular, to the Bucking Unit, or could possibly result in injury or death of personnel. Do not attempt to operate the unit without correct dies and the proper size tubular being in the tong and backup sections of the Bucking Unit. See Section 3 for more information concerning the selection and use of dies.

CAUTION: Operating this equipment without the correct size, type, and orientation of dies can result in damage to the equipment or tubulars being handled.

WARNING

TWO TROLLY SHIPPING BRACKETS, TWO BACKUP SHIPPING HOLD DOWN BOLTS AND TWO BACKUP SHIPPING SPACERS MUST BE REMOVED BEFORE ATTEMPTING TO OPERATE THIS BUCKING UNIT. THESE COMPONENTS ARE PAINTED YELLOW AND PICTURED BELOW.
Failure to remove these components will result in severe equipment damage that will void all warranties.



HYDRAULIC PRODUCT SAFETY

WARNING: Valve lever (spool) may "stick" (not center) under certain conditions allowing the hydraulic equipment to continue to operate and could cause serious injury, death or equipment failure.

VALVE SAFETY: Read and follow instructions carefully. Failure to observe instructions and guidelines may cause serious injury, death or equipment failure. A sticking valve (spool bind) may be caused by one or more of the following factors:

DIRTY OIL: Oil must be filtered to a minimum of 25 microns. Filters should be changed regularly - spin-on types after 50 hours of initial use and then after every two hundred fifty hours of use. Use of a condition indicator is recommended. Consult your tractor or implement owner's manual for filtration and changing recommendations for internal systems.

OIL REQUIREMENTS: Premium quality anti-wear type oil with a viscosity between 100 and 200 SSU at operating temperatures. Certain synthetic oils may cause spool seals to swell and the valve to stick. If in doubt, call CROSS Engineering.

IMPROPER HOOK UP OR MOUNTING: Always use the proper size fittings. Hook up "in" & "out" as noted on the valve body. Do not overtorque pipe fittings. Mounting surfaces should be flat and care should be used when tightening mounting bolts. Over-tightened bolts can cause spool bind and casting breakage. When hooking a valve in series, always use a power beyond sleeve. Consult your tractor or implement manual to make sure you have the proper quick disconnect line connected to the inlet of the remote valve.

MISAPPLICATION: Always use the proper valve for the job. CONVERTA, CD, CS or CA valves should never be used for metered heavy load lifting - loaders or similar applications. Use an open center valve for open center applications and a closed center valve for closed applications. If in doubt, check with your tractor dealer. Contact CROSS if the valve allows the hydraulic equipment to creep excessively.

MAINTENANCE: Make sure all bolts are tightened and torqued to the recommended specification. Bent or broken parts should not be used. Replace immediately. Always use exact replacements. Always protect valve spool from paint overspray.

Faulty quick disconnects can cause high back pressures and sticking spools. Check quick disconnects periodically to make sure they are functioning properly. If valve spool does not center or appears to stick, do not use!

PUMPS & MOTORS SAFETY:

A relief or bypass in your hydraulic system is necessary to prevent pump from breakage due to overpressurization. Use correct fittings and proper oil as noted in the technical service manual packed with each unit. Change oil as recommended by your implement or tractor manufacturer.

CYLINDER SAFETY:

Check clevis clearances before, during and after extending the cylinder and before using the cylinder under pressure to avoid possible injury, or bent or broken rods caused by binding. Never operatea cylinder above recommended pressures. Never use a cylinder as a safety device when trans-porting equipment.

PINHOLE LEAKS:

If you observe a pinhole leak, discontinue use of the component. If oil has penetrated your skin or contacted your eye, seek medical attention immediately!

DESCRIPTION

SUPERIOR Manufacturing & Hydraulics' **CLINCHER®** BUCKING UNITS are used to make up or break out tubular connections in a horizontal position. They are most frequently used in steel mills, pipe yards, or workshop environments. While they are readily transportable and can be trailer mounted, Bucking Units are not usually used at a drill site. For drill site applications, refer to our **CLINCHER®** MAKE/BREAK Tool Operating Manual for information regarding a compact high torque unit.

CLINCHER® BUCKING UNITS utilize the patented **CLINCHER®** Die System which features a self aligning spline system that wraps around the pipe providing coverage up to 330 degrees. The dies distribute the radial load over the largest possible area to minimize pipe stress and deformation. Three different types of dies are available. Our fine tooth steel dies provide the highest possible torque transmission with minimal pipe marking. Non-marking aluminum dies are available for use with fiberglass or corrosion resistant alloy (CRA) tubulars. **CLINCHER® GRIT FACE™** dies are available for chrome and stainless steel tubing applications where steel dies are not acceptable and which require greater torque capacity than non-marking aluminum dies can provide. Adapters which utilize Dovetail strip dies may be available on special order. See Section 3 for more information concerning Die selection and usage.

CLINCHER® BUCKING UNITS have three main components (see Figure 1):

(1) A powered, rotating tong assembly with hydraulically operated jaws which grip the tubular's coupling.

(2) A non-rotating backup assembly with hydraulically operated jaws which grip the body of the tubular.

(3) A frame system which supports the first two items and contains the drive mechanisms and Bucking Unit Control Panel.

A separate hydraulic power unit is required to supply the required hydraulic power to drive the tong and operate jaws.

SUPERIOR Manufacturing & Hydraulics produces three different types of Bucking Units. ***Type One*** is primarily intended for use in pipe mills or pipe yards for the installation (make up) or removal (break out) of couplings. This unit will readily accommodate different sizes of tubulars while allowing the spacing between the tong and backup to be adjusted approximately two feet. When using this type of unit the couplings and tubulars must be fed through either the backup or tong into the other component.

The ***Type Two*** and ***Type Three*** (see Figure 1) Bucking Unit is used for the make up or break out of tool assemblies which have varying diameters and lengths. The ***Type Two*** and ***Type Three*** unit will readily accommodate different sizes of components. The tong and backup spacing can be adjusted from a few inches to many feet.

The ***Type Two*** unit features a chain driven tong with a top loading, open style **LOCKJAW™** Backup to allow easy installation or removal of tubulars or tools using an overhead crane.

The ***Type Three*** unit features a gear driven tong with either a Closed Head Backup *(Type 1)* or a top loading, open style **LOCKJAW™** Backup *(Type 2)*.

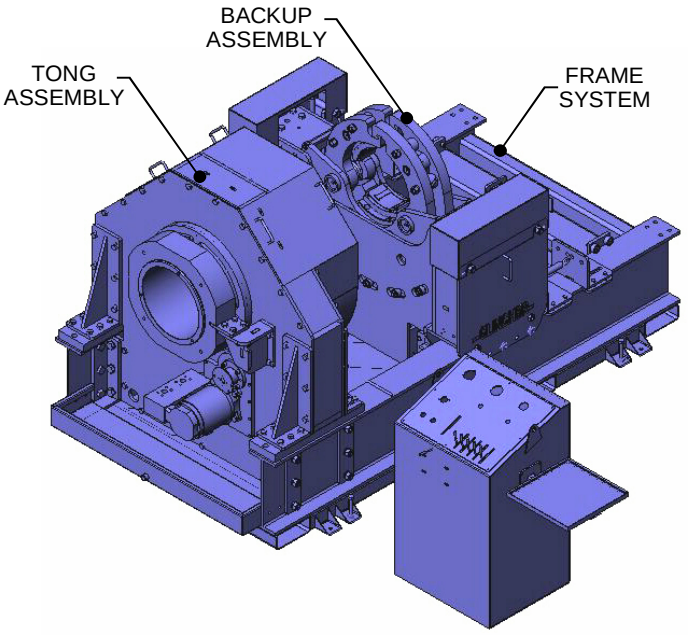


FIGURE 1
CLINCHER® *TYPE 3*
BUCKING UNIT

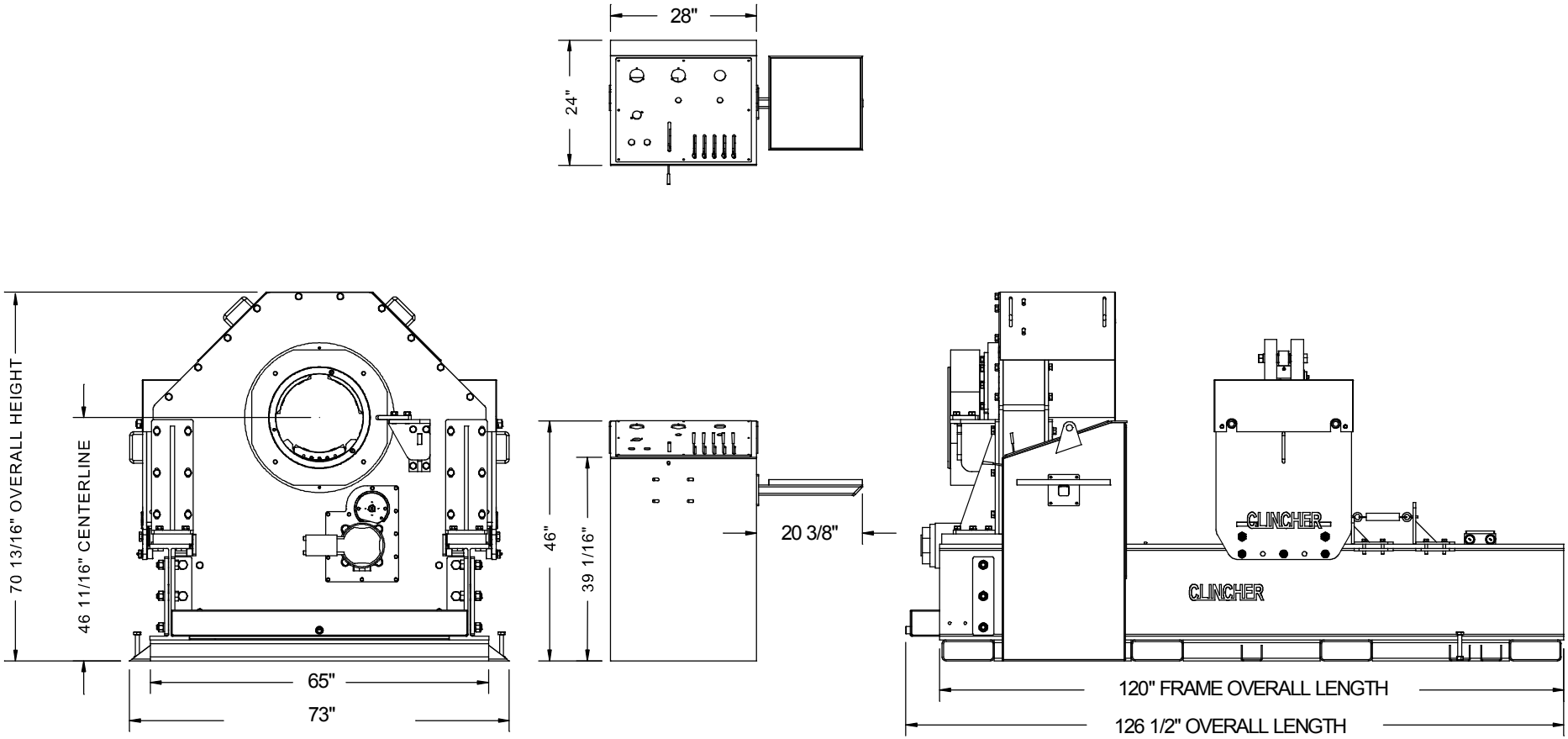


FIGURE 2

APPROX. WEIGHT (LBS.) = 13618

15" BUCKING UNIT DIMENSIONS

CLEBU1500-30

SUPERIOR Manufacturing & Hydraulics
4225 HWY. 90 EAST
BROUSSARD, LA 70518
(318) 837-8847

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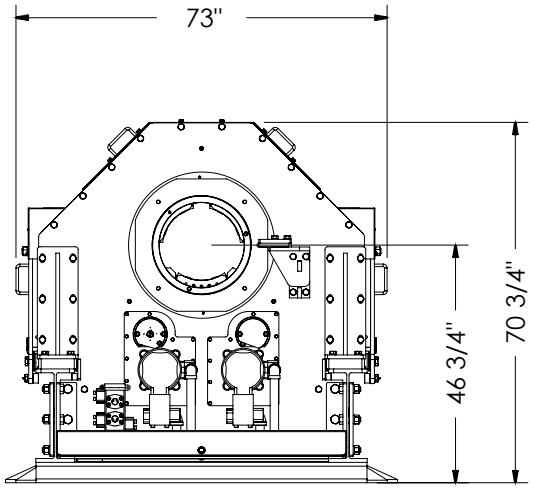

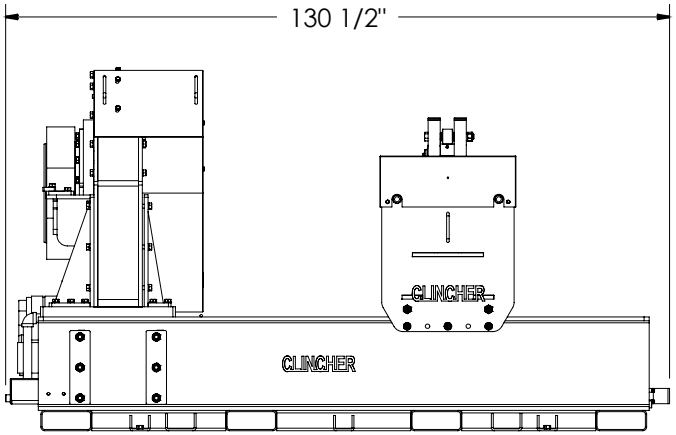

15" BUCKING UNIT DIMENSIONS

CLEBU1500-32

APPROX.WEIGHT (lbs.) = 13319

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REV. #	LOG #	DATE

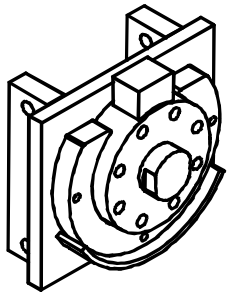
SPECIFICATIONS for CLINCHER® BUCKING UNITS	
TOOL SIZE	**15**
Unit Style (CLEBU1500-30)	Type III Unit w/ **LOCKJAW™** Backup
Backup Torque Gauge Handle	35" (1)
Min Tubular OD (in) (5)	2.062"
Max Tubular OD (2) (in)	15.000
Standard Torque Rating (3) (ft lbs) CLEBU1500-30	50,000
Dies per Tong or Backup (4)	4
Drive Type	Hydraulic
Number of Drive Speeds	2
Max. Hydraulic Power Unit Operating Pressure (psi)	3,000
Max. Clamping Pressure (psi) Intensified using air operated pump	4,500

SPECIFICATIONS for CLINCHER® BUCKING UNITS	
TOOL SIZE	**15**
Unit Style (CLEBU1500-32)	Type III Unit w/ **LOCKJAW™** Backup
Backup Torque Gauge Handle	35 " (1)
Min Tubular OD (in) (5)	2.062"
Max Tubular OD (2) (in)	15.000 "
Standard Torque Rating (3) (ft lbs)	100,000
Series Mode: (6) (8) High Speed / Low Torque Low Speed / High Torque	 12 rpm max. / 25000 ft/lbs max. 6 rpm max. / 50000 ft/lbs max.
Parallel Mode: (8) High Speed / Low Torque Low Speed / High Torque	 6 rpm max. / 50000 ft/lbs max. 3 rpm max. / 100000 ft/lbs max.
Dies per Tong or Backup (4)	3/each, 6/total
Drive Type	Hydraulic
Number of Drive Speeds	2
Max. Hydraulic Power Unit Operating Pressure (psi)	3,000
Max. Clamping Pressure (psi) Intensified using air operated pump (7)	4,500

Important Notes:

1. Handle length is based on use of 8.75" OD (see illustration of Tandem Load Cell Retainer). Reduction from Pinion Shaft (where encoder is attached) to Ring Gear is 8.308:1. Small diameter electronic loadcells may require a bushing or mounting plates to maintain 35" handle length. If diameter of loadcell changes, handle length will change.
2. The maximum tubular OD is the limit of the diameter which can be handled in this unit. The end user should carefully review the maximum diameter of the coupling for the tubular being handled to insure it can be accommodated in the **CLINCHER®** BUCKING UNIT. Contact the manufacturer if other diameters are required.

   Note: After installing electronic load cell in retainer bracket, the load cell must be rotated to close the gap until the button just contacts the load cell brace (Ref. pg. 8-17, Item 4, PN BUCS23204).
3. Higher torque ratings available upon request.
4. Dies and die adapters must be ordered separately.
5. This unit will accommodate large and small diameter tubular goods. Users should exercise caution when making up small diameter low torque connections. Testing should be performed to confirm torque turn system will dump pressure quickly enough to prevent over torquing connections. Reduced rotational speed when approaching make up torque may be required.
6. Requires optional series/parallel valve.
7. Requires 125 PSIA 10 SCFM air supply.
8. Speeds when driven by 40 HP electric hydraulic power unit with 60 GPM variable displacement hydraulic pump.



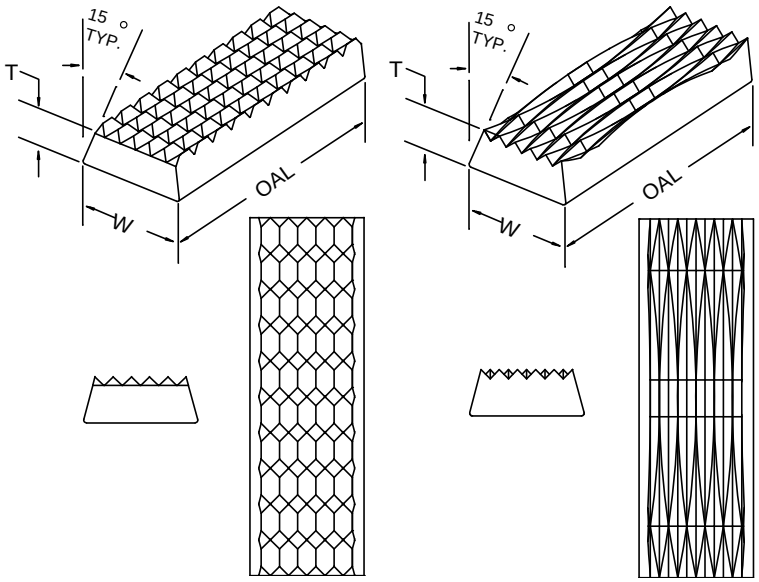
Tandem Load Cell Retainer

CLINCHER® DIES

Many **CLINCHER®** Tongs and Backups utilize jaws and/or adapters which accept Dovetail Inserts (AKA Pencil Dies or Strip Dies) to effectively grip tubulars. Jaw systems and jaw adapters are also available which accommodate Wrap-Around Fine Tooth Steel Dies, **GRIT FACE™** Dies and Aluminum Dies.

The drawings in this section describe the jaw and adapter systems.

The appropriate jaws, die adapters and dies required for a specific tubular OD are also described in this section of the manual.



Thickness	Width	OAL	P/N Straight Tooth	P/N Diamond Tooth
5/16	5/8	3 1/2	*	*
5/16	5/8	3 7/8	DTI4052	*
5/16	5/8	4 1/2	DTI4002	*
3/8	5/8	3 1/2	DTI4030	*
3/8	5/8	3 7/8	DTI4051	*
3/8	5/8	4 1/2	DTI4001	*

Thickness	Width	OAL	P/N Straight Tooth	P/N Diamond Tooth
17/32	5/8	3 1/2	DTI4031	*
17/32	5/8	3 7/8	DTI4053	*
17/32	5/8	4 1/2	DTI4003	*
5/8	5/8	3 1/2	DTI4032	*
5/8	5/8	3 7/8	DTI4054	*
5/8	5/8	4 1/2	DTI4004	*
11/16	5/8	3 7/8	DTI4055	*
11/16	5/8	4 1/2	DTI4005	*
3/8	1	3 7/8	DTI1505	*
3/8	1 1/4	3 7/8	DTI1614	*
3/8	1 1/4	5	DTI1610	*
7/16	1 1/4	3 7/8	DTI1612	DTI1612D
7/16	1 1/4	5	DTI1617	DTI1617D
1/2	1 1/4	3 7/8	DTI1601	DTI1601D
1/2	1 1/4	5	DTI1602	DTI1602D
9/16	1 1/4	3 7/8	DTI1622	DTI1622D
9/16	1 1/4	5	DTI1623	DTI1623D
5/8	1 1/4	3 7/8	DTI1632	DTI1632D
5/8	1 1/4	5	DTI1633	*
11/16	1 1/4	3 7/8	DTI1642	*
11/16	1 1/4	5	DTI1646	*
3/4	1 1/4	3 7/8	DTI1651	*
3/4	1 1/4	5	DTI1693	*
3/4	1 1/4	5 7/8	DTI1662	DTI1662D
13/16	1 1/4	3 7/8	DTI1661	*
13/16	1 1/4	5	DTI1664	*
7/8	1 1/4	3 7/8	DTI1671	*
7/8	1 1/4	5	DTI1673	*
1	1 1/4	3 7/8	DTI1691	*
1	1 1/4	5	DTI1697	*

* Available upon request.

STRAIGHT TOOTH **DIAMOND TOOTH**

Note: Diamond Tooth Dies are used when a more aggressive bite is required.

CLINCHER® WRAP-AROUND DIES

CLINCHER® wrap around dies are available in three types:

Fine Toothed Steel Dies: for low to ultra high torque applications on carbon steel tubulars including tubing, casing and drill pipe

Smooth Faced Aluminum Dies: for low to moderate torque applications on fiberglass and corrosion resistant alloy (stainless steel) tubulars

GRIT FACE™ Dies: for low to high torque applications on fiber-glass and corrosion resistant alloy (stainless steel) tubulars where the use of steel dies is prohibited as well as on carbon steel tubulars where reduced marking is desired

CLINCHER® Bucking Units utilize wrap around dies to maximize pipe coverage allowing maximum torque transmission while minimizing marking and virtually eliminating the possibility of deforming the pipe. These tools have 3 or 4 jaws which accept our dies. **CLINCHER®** Dies are designed to match the OD of the tubing, casing, coupling or accessory being made up or broken out. Each die is stamped on the top or side to identify its size.

Using fine toothed steel dies which are slightly larger than the tubular is acceptable provided the difference in diameters is less than 3/32" (0.093"). The fine toothed steel dies we are providing for pipe and couplings are manufactured with an ID which is approximately 0.050" larger than the nominal die size. This provides a die which will readily grip pipe and couplings which are manufactured to API external diameter tolerances. In the case of pipe and couplings whose nominal OD is greater than 5 1/2", the API maximum diameter tolerance range can theoretically exceed the die diameter. Should this situation arise, the die will still grip the pipe but will have reduced contact area as the pipe may not contact the die along its midline. It is important to note we have not had any reports of die problems with extremely oversized tubulars. This is probably due to the fact that modern mills are able to control the OD of their products to much tighter tolerances than permitted by the API standards.

Aluminum and **GRIT FACE™** dies should be matched with the specific tubular diameters required. Our non-marking aluminum die system is manufactured with an ID which is 0.035" larger than the nominal die diameter. We have to use a closer fit between the nominal tubular and the die since this system relies on radial loads and the coefficient of friction instead of teeth. This clearance also allows the installation of our silicon carbide screen cloth which is required when using the non-marking system at high torques.
Note: The use of improperly sized dies can result in reduced torque capacity, increased pipe marking and reduced die life.

The bucking unit cylinders (which hold our dies) have considerable stroke which could cause some people to believe they can use a die on a tube which is significantly smaller than the nominal size. For example, someone could use a 7" die to grip on a non-standard tubular with an OD of 6.75". While one could successfully grip tubulars with such an arrangement, the pipe would not be exactly centered within the rotating and fixed portions of the bucking unit. The resulting eccentric pipe movement seen when rotating the collar could cause some variation in apparent torque readings. Therefore, we recommend nominal die sizes be matched to specific pipe or coupling diameters and using specially manufactured dies for non-standard premium couplings.

CAUTION: Do not attempt to grip tubular diameters which are larger than the dies being used. Failure to observe this precaution can result in damage to the tubular or the bucking unit.

CAUTION: Do not attempt to use combinations of different die sizes to accommodate a nonstandard tool joint or coupling OD when the correct size dies are not available. Using mismatched die sizes or different die types can cause the tubulars to run eccentrically resulting in erratic torque measurements. This can also initiate thread galling.

CLINCHER® Wrap-Around Dies are manufactured in specific diameters to match standard tubing and casing diameters, API coupling diameters, selected work string connection diameters and certain commonly used premium connection coupling diameters. **CLINCHER®** Wrap-Around Dies should not be used on tubulars which are larger than the nominal die size. Steel toothed dies can be used on tubulars which are no smaller than 3/32" (0.093") less than the nominal die size. Aluminum and **GRIT FACE™** dies should be matched with the specific tubular diameters required.

Note: Fine toothed steel dies in sizes 7 5/8" and smaller are normally stocked in our Broussard, Louisiana facility. Aluminum and **GRIT FACE™** Dies are normally made to order although a limited range of sizes and small quantities may be available from stock. Contact SUPERIOR Manufacturing & Hydraulics, Inc. for information concerning availability of stock, large diameter and special die sizes.

CLINCHER® WRAP-AROUND DIES

DIE Nomenclature for CLINCHER® Bucking Unit

BUC1500-xxxx fine toothed steel dies available in sizes from 15" to 11 3/4"

BUCA1500-xxxx aluminum dies available in sizes from 15" to 11 3/4"

BB1500-xxxx **GRIT FACE™** dies (contact Superior f/ size availability)

Note when using dies on tubulars with OD of 11 3/4" or less it is necessary to install reducing adapters in the bucking unit cylinder. *(Die Adapter 15"-11 3/4" P/N BUA15-11750A, 15"-10 3/4" P/N BUA15-1075A and Die Adapter 15"-8 5/8" P/N BUA15-8625A..)* The adapters will accommodate smaller sizes listed below.

CLEBU1175-xxxx fine toothed steel dies available in sizes from 11 3/4" to 7 5/8"

CLEA1175-xxxx aluminum dies available in sizes from 11 3/4" to 7 5/8"

BB1175-xxxx **GRIT FACE™** dies available in sizes from 11 3/4" to 7 5/8"

BUC7625-xxxx fine toothed steel dies available in sizes from 7 5/8" to 2 1/16"

BUCA7625-xxxx aluminum dies available in sizes from 7 5/8" to 2 1/16"

BB7625-xxxx **GRIT FACE™** dies available in sizes from 7 5/8" to 2 1/16"

ORDERING EXAMPLE: Fine toothed steel dies are needed to makeup 8 5/8" OD casing with 9 5/8" OD couplings

Qty. Req'd: Six pieces BUA1500-11750
(for tong and backup assembly)
and
Qty. Req'd: Three pieces BUC1175-9625
(for tong assembly)
and
Qty. Req'd: Three pieces BUC1175-8625
(for backup assembly)
(Replace xxxx with size req'd in inches)

Contact SUPERIOR Manufacturing & Hydraulics, Inc. for information concerning availability of stock and special die sizes.

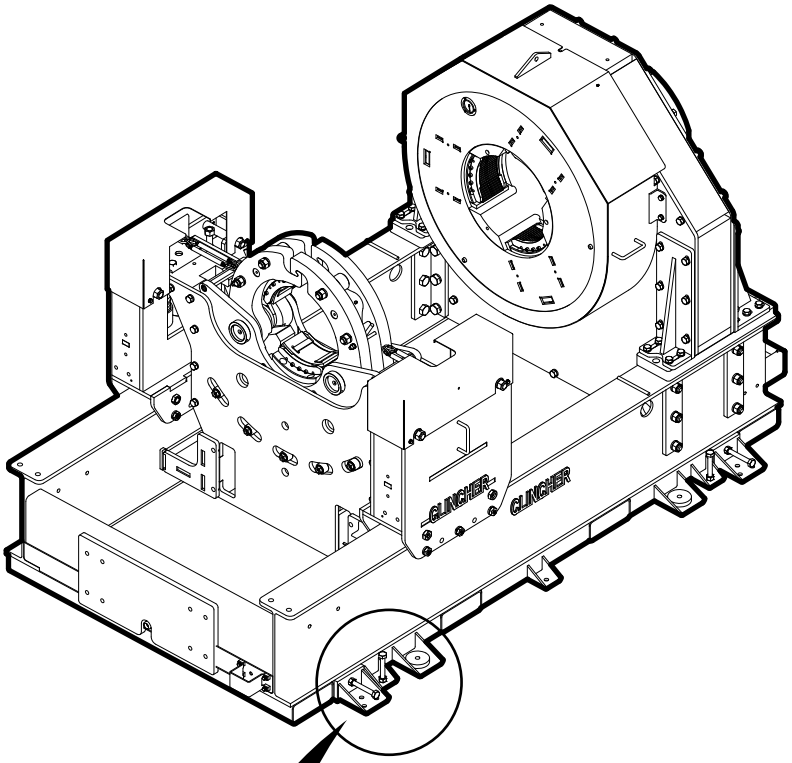
CLEBU1500-32

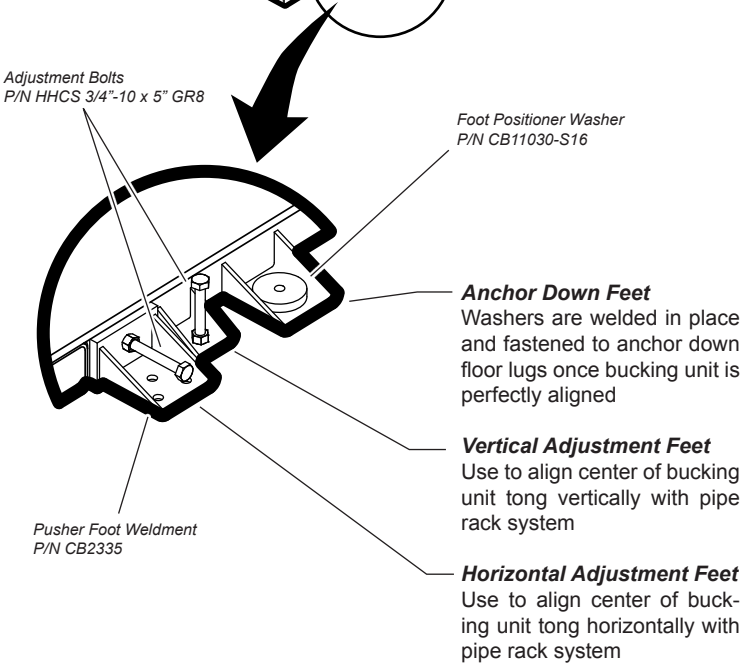
Tools & Equipment Required for Setup and Commissioning

- ☐ Laser transit and qualified operator to align bucking unit with pipe racks
- ☐ Welding machine and qualified welder to fix foot positioner washers to bucking unit mounting feet
- ☐ Wire brush to clean up weld zone and touch up paint
- ☐ (2) sets of 1/2” to 1 1/8” open/box end wrenches
- ☐ (1) 1/2” Drive set of 1/2” to 1 1/8” sockets
- ☐ (1) 1/2” Drive set of 5/16” to 5/8” allen sockets
- ☐ (1) 1 1/2” Socket
- ☐ (1) 1 7/16” Socket
- ☐ (1) 3/32” Allen wrench
- ☐ (2) 5/16” Allen wrenches
- ☐ (1) 15/64” Allen wrench
- ☐ (1) 1/2” Drive ratchet
- ☐ (1) 1/2” Drive impact wrench
- ☐ (2) 18” Crescent wrenches
- ☐ (2) 18” Pipe wrenches
- ☐ Set of screwdrivers (phillips and flathead)
- ☐ Loctite 7649 activator
- ☐ Loctite 542 thread sealant
- ☐ Never Seez
- ☐ 150 gallons of premium hydraulic oil (Texaco Rando HD 68 or equivalent) as well as means to transfer and pre-filter the oil from barrels to hydraulic power unit reservoir
- ☐ Grease gun and grease specified in bucking unit technical manual

» If anchor bolts are not pre-installed in concrete slab:

- ☐ Hammer drill and drill bits
- ☐ 3/4” diameter x 6” long or equivalent anchor bolts, nuts, and locknuts





Anchor Down Feet
Washers are welded in place and fastened to anchor down floor lugs once bucking unit is perfectly aligned

Vertical Adjustment Feet
Use to align center of bucking unit tong vertically with pipe rack system

Horizontal Adjustment Feet
Use to align center of bucking unit tong horizontally with pipe rack system

Electrical Checklist

- ☐ Electrical cable *
- ☐ Electrical conduit *
- ☐ Misc. electrical parts to supply point to bucking unit *
- ☐ At minimum, install at least one (1) 6’ long (2 meter) ground rod to earth the hydraulic power unit and #2AWG ground wires for use between the hydraulic power unit, control console, and bucking unit (**NOTE: These items are not supplied as local electrical codes may dictate other means**) *
- ☐ Wire cutters
- ☐ Wire strippers
- ☐ Volt / OHM meter
- ☐ 110/240 VAC 50/60Hz Uninterruptable Power Supply (UPS) with electrical filter and surge suppressor for WinCATT system and printer

» **NOTE: Power to PLC, solenoids, and proportional controller should be provided from a clean source (not direct from a generator or mains where voltage variation, surges, or outages are frequent)**

Air Hookup Checklist

- ☐ (1) CB11041 Regulator / filter
- ☐ (1) 1480 Ball Valve
- ☐ Fittings depending on proximity of unit from main line / current setup
- ☐ Minimum 50’of air hose (length may vary depending on existing installation and proximity)

Contingency Materials

- ☐ Safety Solvent for cleaning pneumatic & hydraulic quick disconnects
- ☐ Electrical contact cleaner solution
- ☐ Soldering iron (for WinCATT cable connector repair)
- ☐ Teflon tape or Loctite sealing compound

** Electrical material as required to suit installation and local electrical code*

CLINCHER® WORLDWIDE • YEARS AHEAD

SUPERIOR Manufacturing & Hydraulics

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Manual/PLC Controlled Bucking Unit
INSTALLATION & SETUP INSTRUCTIONS

IMPORTANT NOTICE: Insure steps 1 through 7 have been completed before notifying Superior Manufacturing & Hydraulics that a factory technician is needed to perform installation inspection and final startup services. If these steps have not been completed, additional charges will be applied while our technician stands-by for the installation to be completed by the buyer.

1. **UNPACK** – Inspect for shipping damage and/or missing items. Immediately document and report any suspected shipping damage. Remove all banding straps and protective coverings. Do not remove shipping bolts and brackets before the Bucking Unit has been moved to its final location and no further handling is required. Refer to illustration on page 1-1 to identify location of shipping brackets and bolts.

   a. **WARNING - CLINCHER® 15" Bucking Units weight more than 13,500 lbs. and must be handled with appropriate equipment and procedure to avoid exposing personnel to hazards or potentially damaging the equipment.**

2. **READ HAZARD WARNINGS and TECHNICAL MANUAL** – The first section of the technical manual contains specific information about Operating Procedures which if not strictly followed could result in serious injury, loss of life, damage to equipment or damage to tubulars. Other important information is contained throughout the technical manual. Thoroughly familiarize yourself and others working with you with this information before commencing installation or operation.

   a. **A JSA should be undertaken before commencing installation work or using installed equipment. Untrained personnel must not handle, install or operate this equipment.**

3. **INSTALL - CLINCHER®** BUCKING UNITS must be installed on a foundation suitable for the weight of the unit, its accessories, pipe handling equipment plus the weight of the heaviest tubulars being processed. Leveling jacks are not provided (but are available as options) and may be required to insure the unit is supported on each of the four corners. When possible, we recommend the unit be anchored to the foundation using 3/4" anchor bolts. Install the bucking unit, hydraulic power unit and torque turn control system as required on location. NOTE: If pipe roller rack systems are being installed they must be accurately leveled and aligned with the bucking unit to deliver pipe into the bucking unit on the centerline of the rotating tong.

   b. **SUPERIOR strongly recommends the use of our LASER ALIGNMENT TOOLS to verify proper alignment before permanently fixing anchor bolts.**

   c. **CAUTION:** Failure to align rack centerline with bucking unit may cause tubulars to hang on dies when passing through the bucking unit. Misalignment can result in unacceptable torque-turn results.

   d. Remove shipping bolts/brackets/etc., as shown in illustration on page 1-1.

4. **INSTALL** Control Console and Hydraulic Power Units at locations as required. Refer to order documents for lengths of hoses supplied with equipment.

5. **FILL POWER UNIT RESERVIOR WITH HYDRAULIC FLUID -** Unless specifically noted, all hydraulic power units are shipped without hydraulic oil. Refer to order documents to determine the volume of hydraulic oil required to fill the hydraulic reservoir. The SUPERIOR Hydraulic Power Units and the **CLINCHER®** BUCKING UNIT are designed to work with conventional industrial hydraulic oils. Superior Manufacturing & Hydraulics utilizes TEXACO Rando HD 68 hydraulic oil. Substitution of brands with comparable properties is acceptable. Use of low viscosity fluids or high viscosity fluids, synthetic, fire resistant or water-based fluids should not be considered without consulting with SUPERIOR Manufacturing and Hydraulics.

   a. **CAUTION:** Insure hydraulic fluid reservoir is totally clean and dry before filling with oil. All hydraulic fluids, including new hydraulic oil, must be filtered to 5 microns before adding to the reservoir. Fill the hydraulic reservoir with the appropriate filtered hydraulic fluid to within 4 inches from top of reservoir.

   b. **CAUTION**: Insure the suction isolation valve is open before starting power unit. **Failure to open this valve will cause catastrophic pump failure.**

   c. **Note:** The electrically driven hydraulic power unit is equipped with a low fluid level switch which will automatically shut down HPU electrical motor if fluid level drops below safe operating level. Refill unit before attempting to restart HPU. Some units may be equipped with optional second fluid level warning lamp which will flash when fluid level is low but not low enough to cause HPU shutdown.

6. **CONNECT HOSES -** Remove all hose dust caps as required and clean all hydraulic quick disconnect couplings with safety solvent and blow dry using low-pressure compressed air.

a. Connect airlines to DE-ENERGIZED source of clean and dry air with maximum supply pressure of 120 psi.

b. Connect hydraulic hoses and insure all quick disconnects are fully seated. Connect case drain line directly to reservoir, do not attach to a return circuit.

c. **CAUTION: Failure to connect case drain circuit directly to hydraulic reservoir will result in motor shaft seal failure and cause hydraulic leakage that will not be covered by your warranty.**

d. Failure to connect load sense line will inhibit the hydraulic power unit's ability to automatically shift into a standby mode when work is not being performed. This may cause undesirable heat build up, higher energy costs, and could result in shortened life of hydraulic fluid and/or components.

7. **ELECTRICAL POWER FOR HYDRAULIC POWER UNIT – <u>LOCKOUT ELECTRICAL POWER AT DISTRIBUTION POINT.</u>** Refer to order documents to determine the electrical voltage and power requirements. **<u>DO NOT ENERGIZE CIRCUITS AT THIS TIME.</u>**

   a. Connect appropriate electrical power to motor starter. Connect remote control cord from control console to hydraulic power unit's motor starter enclosure.

   b. Insure all components are electrically interconnected with heavy gauge ground wires and to a suitable ground rod.

   c. **CAUTION: Use locally licensed electrical contractors to insure proper hookup complying with local electrical codes.**

8. **If unit is to be started up by Superior's factory technicians, STOP installation procedures now and notify Superior Manufacturing & Hydraulics that the unit is now ready for Superior's technicians to perform startup services. If owner is performing installation and startup, follow procedures in step 9.**

9. **INITIAL START UP** –

   a. **CAUTION:** Insure all control valve levers are in neutral position.

   1) Remove cover from HPU pump motor adapter housing.

   2) Energize electrical power to HPU starter. Do not energize air supply at this time.

   3) Set control console selector switch to manual control (for PLC controlled units only).

   4) Bump Start and Stop motor controls to verify motor direction of rotation is correct as indicated by directional arrow on HPU coupling housing. **CAUTION: Running pump in the wrong direction will cause catastrophic pump failure which will not be covered by manufacturer's warranty**. Change direction of motor rotation if required by swapping electrical phases in motor starter enclosure.

   5) De-Energize electrical power to HPU starter. Reinstall cover on HPU coupling housing.

   6) Energize electrical power to HPU starter. Start HPU using switch on console and allow HPU to run for 10 minutes to purge air from primary circuits while monitoring for leakage.

   7) Shift mode shift valve lever to "LOW" position.

   8) Slowly shift motor valve lever from neutral to "MAKEUP" position and allow the unit to rotate for 1 minute.

   9) Shift motor valve lever to "BREAKOUT" position and allow the unit to rotate for 1 minute.

   10) Shift mode shift valve lever to "HIGH" position while rotating in "BREAKOUT" for one minute.

   11) Reverse motor valve lever to "MAKEUP" and allow unit to rotate for 1 minute.

   12) Release motor valve lever.

   13) Return mode shift valve lever to mid or neutral position.

   14) Verify hydraulic power unit automatically shifts from operating mode to standby mode by observing system pressure gage dropping to approximately 500 psi a few seconds after the demand for power has been removed.

   15) Actuate tong clamp valve lever to extend clamping cylinders. Release lever and allow it to return to the neutral position. **CAUTION: Do not allow pressure to build beyond 1,000 psi unless the dies and pipe are installed. Pressurizing the tong clamping cylinders without dies and pipe in position can cause failure of the cylinder gland bolts.**

   16) Actuate tong clamp valve lever to retract clamping cylinders. Release lever and allow it to return to the neutral position.

   17) Repeat steps 15) and 16) six (6) times.

   18) Actuate backup clamp valve lever to extend clamping cylinder. Release lever and allow it to return to the neutral position. **CAUTION: Do not allow pressure to build beyond 1,000 psi unless the dies and pipe are installed. Pressurizing the backup clamping cylinder without dies and pipe in position can cause failure of the cylinder gland bolts.**

19) Actuate backup clamp valve lever to retract clamping cylinder. Release lever and allow it to return to the neutral position.

20) Repeat steps 18) six (6) times and 19) five (5) times leaving backup in closed position.

21) For bucking units equipped with optional hydraulic jacks, pipe rollers, backup carriage positioners, etc., duplicate steps 18), 19) and 20) for each control valve and circuit to purge air and confirm proper operation.

22) STOP HPU using switch on console.

23) Release any trapped hydraulic pressure by fully actuating all control valve levers in both directions several times.

24) Top off hydraulic fluid level in reservoir to makeup for volume of fluid used to fill lines and cylinders. NOTE: Some HPU's may be equipped with optional fluid level sensors which will shut down the HPU if a low fluid level condition develops.

25) INSTALL LOCKOUT on electrical disconnect.

26) Install compression load cell (hydraulic or electronic as applicable) through "MAKEUP" window into position within the backup. **CAUTION: Load cells with diameters other than 8.750 inches will alter torque handle length and will require compensation to indicate correct torque.**

27) Attach hydraulic torque gage to control console or rig up electronic torque turn system's turns encoder, electronic load cell and hydraulic dump valve solenoid cables (supplied by others) using third party instructions as applicable. Set torque turn system for test sub connection's makeup torque.

28) Install dummy load cell (aluminum or steel blank) through "BREAKOUT" window into position within the backup.

29) Obtain test sub with threaded connection and start coupling by hand.

30) Install correctly sized dies in tong and backup. REFER TO OPERATING INSTRUCTIONS, DIE INSTALLATION page 5-2 for details regarding die installation and operation.

31) REMOVE LOCKOUT from electrical disconnect.

32) Restart HPU.

33) Actuate backup clamp valve lever to retract clamping cylinder and open the backup. Release lever and allow it to return to the neutral position.

34) STOP HPU using switch on console.

35) Install test sub in bucking unit with midline of coupling approximately adjacent to end of dies in tong to avoid clamping on female thread to be made up.

36) Insure test sub is level, positioned vertically on center in tong and aligned with centerline of the bucking unit.

37) RESTART HPU.

38) Actuate tong clamp valve lever to extend clamping cylinders and clamp on the test sub's coupling. System pressure should rise to approximately 2500 psi or pressure established by operator for specific tubular application. **CAUTION: Use minimum clamping pressure possible to avoid possible crushing damage to tubular goods.** Release the lever and allow it to return to the neutral position.

39) Actuate backup clamp valve lever to extend clamping cylinder. System pressure should rise to approximately 2500 psi or pressure established by operator for specific tubular application. **CAUTION: Use minimum clamping pressure possible to avoid possible crushing damage to tubular goods.** Release lever and allow it to return to the neutral position.

40) NOTE: If using smooth aluminum dies or if slippage is experienced, torque capability may be increased by using **GRIT FACE™** or steel dies. Alternately increasing clamping pressure using intensifiers may provide higher torque capability. Refer to Air Driven Hydraulic Intensifier information on pages 10-1 and 10-2.

    a) Energize air circuit. **CAUTION: Use minimum clamping pressure possible to avoid possible crushing damage to tubular goods. CAUTION: Do not actuate intensifiers unless the pipe and the correct sizes of dies are installed in the tong and backup. Failure to comply with this requirement will cause extensive equipment damage and expose personnel to dangerous high pressure hydraulic leaks.**

    b) Actuate tong clamp valve lever to extend clamping cylinders and clamp on the test sub's coupling. System pressure should rise to approximately 2500 psi or pressure established by operator for specific tubular application. **CAUTION: Use minimum clamping pressure possible to avoid possible crushing damage to tubular goods.** While holding the control valve lever in the clamp position, rotate the tong clamp intensify valve allowing air pressure to drive

tong's booster pump. Pressure will rise in the tong to approximately 3500 psi and can be observed on the pressure gage in the tong head. Release the lever and allow it to return to the neutral position.

c) Actuate backup clamp valve lever to extend backup clamping cylinder and clamp on the test sub. System pressure should rise to approximately 2500 psi or pressure established by operator for specific tubular application. **CAUTION: Use minimum clamping pressure possible to avoid possible crushing damage to tubular goods.** While holding the control valve lever in the clamp position, rotate the backup clamp intensify valve allowing air pressure to drive backup booster pump. Pressure will rise in the backup to approximately 3500 psi and can be observed on the pressure gage in the backup. Release the lever and allow it to return to the neutral position.

d) Return tong and backup intensify valves to the off position.

41) Shift mode valve lever to "LOW" position. Note: Connections requiring a large number of turns can be rotated in "HIGH" mode to reduce makeup time. Connections requiring makeup torques greater than 50% of the Bucking Units maximum torque rating will require shifting to "LOW" mode to complete makeup to final torque.

42) Slowly shift motor valve lever from neutral to "MAKEUP" position and allow the unit to rotate until desired makeup torque is observed on the torque gage. Immediately release the motor valve lever and allow it to return to the neutral position to avoid over-torquing the connection. Alternately hold the motor valve lever in the "MAKEUP" position until the torque turn computer system reads the required makeup torque and opens the dump valve to stop rotation. Immediately release the motor valve control and allow it to return to the neutral position.

a) To break out connection, slowly shift motor valve lever from neutral to "BREAKOUT" position and allow the unit to rotate until the connection has backed off at least two turns.

43) Actuate tong clamp valve lever to retract clamping cylinders. Release lever and allow it to return to the neutral position.

44) Actuate backup clamp valve lever to retract clamping cylinder.

45) STOP HPU using switch on console.

46) Release any trapped hydraulic pressure by fully actuating all control valve levers in both directions several times.

47) Bucking unit should now be ready for operation. Refer to technical manual to review maintenance procedures and for selecting, changing, and using dies.

FOR USERS OF REMOTELY OR AUTOMATICALLY OPERATED EQUIPMENT USING PLC CONTROLLERS PLEASE MAKE NOTE OF RECOMMENDED OPERATING PROCEDURES AND SETUP LISTED IN STEP 10.

10. Refer to electrical schematic for connecting PLC to electrical terminal strip located in control console enclosure. Note: Electrical cables between valves and enclosure are long enough to allow the enclosure to be removed from the interior of the console for easy servicing. Refer to Solenoid Power Requirements and table on page 5.

a. Manually setup bucking unit for pipe to be made-up including selecting and installing dies in tong and backup, adjusting system hydraulic pressure, determining if pressure intensification is required, if pipe will be made up using "high" mode, "low" mode or combination of high and low modes. Note some units may also have "series high" and "parallel low" controls to increase rotational speed.

b. Insure PLC is programmed for the following typical sequence of makeup operations.

1) Energize hydraulic power unit.

2) Optional - Verify hydraulic system pressure is available.

3) Optional – Verify air pressure is available.

4) Optional – Verify absence of coupling in tong.

5) Energize tong release circuit to insure cylinders are retracted.

6) Energize backup release circuit to insure cylinder(s) is (are) retracted.

7) Verify tong centering cylinder is in bottom dead center (BDC) position (sense using customer supplied proximity sensor or absolute encoder).

a) If centering cylinder is not in BDC position, energize the gear shift valve solenoid to shift to "low gear" position.

Manual/PLC Controlled Bucking Unit
INSTALLATION & SETUP INSTRUCTIONS

REMOTELY OPERATED BUCKING UNITS REQUIRE OPTIONAL ELECTRICALLY CONTROLLED SOLENOID OPERATED HYDRAULIC CONTROL VALVES. ELECTRICAL CONTROL PANELS, PROGRAMMABLE CONTROLLERS, POWER SUPPLIES AND SENSORS ARE OPTIONAL AND NOT INCLUDED. END USERS WHO ARE PROVIDING THEIR OWN CONTROL SYSTEMS MUST INSURE THEIR ELECTRICAL CONTROL SYSTEM AND POWER SUPPLIES ARE CAPABLE OF DELIVERING THE CORRECT ELECTRICAL VOLTAGE AND ADEQUATE CURRENT TO POWER THE SOLENOIDS AS TABULATED BELOW.

FUNCTION	VOLTAGE Required	POWER Required
Proportional motor control module	-10VDC to +10VDC	0.80 amps
Tong motor control solenoid[1] (from control module)	6VDC to 12VDC forward 12VDC neutral 12VDC to 18VDC reverse	0.44 amps
Tong motor high/low control solenoids[2]	24VDC	0.33 amps
Tong motor series/parallel control solenoids [2]	24VDC	0.33 amps
Tong cylinder clamp/release control solenoids [2]	24VDC	0.33 amps
Backup cylinder clamp/release control solenoids [2]	24VDC	0.33 amps
Tong cylinder intensifier control valve solenoid [3]	24VDC	0.60 amps
Backup cylinder intensifier solenoid [3]	24VDC	0.60 amps
Tong motor circuit dump valve solenoid [4]	24VAC/VDC	31w (78VA hold, 264VA inrush)

1. Sauer Danfoss PVG120 proportional control valve
2. Sauer Danfoss PVG32 on-off control valve – requires two separate signals to control both functions
3. Ross 2771B4011 normally closed solenoid valve
4. Veljin VVV01 or Denison VV01solenoid operated vent valve (driven by torque-turn computer or PLC supplied by others)

b) Energize "low" motor speed, "parallel low" (if equipped) and tong motor valve solenoids to "makeup" position. Rotate tong in makeup direction until centering cylinder is in bottom position.

8) Feed pipe with coupling into bucking unit until coupling is correctly positioned in tong adjacent to dies (sense correct position of coupling using customer supplied proximity switch).

9) Energize tong clamp circuit to insure cylinders are extended and gripping pipe.

   a) Energize tong clamp intensifier if required.

   b) De-energize tong clamp circuit to allow directional control valve to return to neutral position (clamping pressure will trapped by pilot operated check valves). **CAUTION: if clamp circuit is not de-energized to allow hydraulic pressure to bleed off before rotating the tong, you will experience heat buildup in the swivel housing, premature seal failure, and/or accelerated wearing of hub sealing surfaces which will not be covered by your warranty.**

10) Energize backup clamp circuit to insure cylinder extends and lockjaw backup is gripping pipe.

   a) Energize backup clamp intensifier if required.

   b) De-energize backup clamp circuit to allow directional control valve to return to neutral position (clamping pressure will be trapped by pilot operated check valves).

11) Energize tong motor speed circuit in high or low, and "series" or "parallel" (if equipped) as required.

12) Energize tong motor makeup circuit to tighten connection.

   a) Monitor makeup of connection, using time or number of turns, and shift from "HIGH" to "LOW" and "series" to "parallel" mode if required.

   b) Monitor makeup of connection using torque turn computer until required torque is reached and computer sends power to energize dump valve solenoid coil indicating makeup has been completed.

c) NOTE: Torque Turn systems provide an alternate means of identifying incorrect make-ups which must be used to initiate a connection breakout cycle to permit inspection of connection.

13) De-energize tong and backup clamp intensifier circuits.

14) Energize backup retract (open) circuit to insure cylinder retracts and lockjaw backup opens to clear pipe. Monitor system pressure verses time to verify backup is fully open (or use customer supplied proximity switch to sense position).

15) De-energize backup retract circuit.

16) Energize tong retract (open) circuit to insure cylinders retract and tong opens to clear coupling. Monitor system pressure verses time to verify tong is fully open.

17) De-energize tong retract circuit.

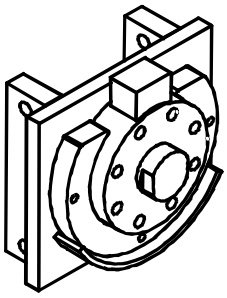
18) Feed pipe to rack to clear Bucking Unit.

19) Energize "low" motor speed, "parallel low" (if equipped) and tong motor valve solenoids to "makeup" position. Rotate tong in makeup direction until centering cylinder is in BDC position.

20) Optional – De-energize HPU.

21) Repeat steps 1 thru 20 as required.

INSTALLATION INSTRUCTIONS
TANDEM LOAD CELL RETAINER



After installing electronic load cell in retainer bracket, the load cell must be rotated to close the gap until the button just contacts the load cell brace (Ref. pg. 8-17, Item 4, PN BUCS23204).

LUBRICATION SPECIFICATIONS

Use an EP synthetic grease that meets or exceeds the following specifications: (Used in tong case)

Type	High Temp MP
NLGI Consistency Grade	1
Color	Medium Green
Lithium Complex Soap, wt%	Non Soap
Serv. Temperature	0 Deg. F – 450 Deg. F
Base Oil Viscosity: @ 100º F @ 200º F	1300 SUS 89 SUS
Viscosity Index	77
Penetration, dmm Worked *ASTM D 217*	325-340
Dropping Point, ºF *ASTM D 566*	500 ±
Rust Protection, 5% SSW	N/A
Water Washout %wt loss @ 175ºF	N/A
Timken, OK Load, lbs	50
Bomb Oxidation 100 hrs @ 210ºF, psi drop	N/A
Applications	High & Low Speed Bearings, Wheel Bearings, Pumps, Gears, Lubrication

Use an EP synthetic grease that meets or exceeds the following specifications: (Used as bearing grease)

Type	N/A
NLGI Consistency Grade	2
Color	Blue
Lithium Complex Soap, wt%	14
Serv. Temperature	N/A
Base Oil Viscosity: @ 40ºC, cSt *ASTM D 445* @ 100ºC, cSt	150 14.5
Viscosity Index	N/A
Penetration, dmm Worked, 60X *ASTM D 217*	280
Dropping Point, ºF *ASTM D 2265*	450+
Rust Protection, 5% SSW *ASTM D 5969*	Pass
Water Washout %wt loss @ 175ºF *ASTM D 1264*	6.8
Timken, OK Load, lbs *ASTM D 2509*	45
Bomb Oxidation 100 hrs @ 210ºF, psi drop *ASTM D 942*	5 max
Applications	Industrial application where a high temperature/multipurpose extreme pressure grease is needed, Trailers

Use a premium quality hydraulic fluid that meets or exceeds the following specifications:

Humble Hydraulic H		68
ISO Viscosity Grade		68
Base Oil Viscosity: *ASTM D 445*	cSt @ 40ºC cSt @ 100ºC	65.0 8.5
Viscosity Index – *ASTM D 2270*		95
Pour Point – *ASTM D 97*		-9
Flash Point – *ASTM D 92*	C(ºF)	222 (432)
Demulsibility – *ASTM D 1401*		41/39/0 (20)
Vickers 104C (IP281)		Pass
Vickers M-2950-S		Quality Level
Vickers I-286-S		Quality Level
TOST – *ASTM D 943*		2000+

OPERATING INSTRUCTIONS

The basic procedures to be used when handling and bucking up collars on tubulars should be as follows:

1. Couplings should be started by hand on the pipe.

2. The pipe and coupling are moved by means of a crane or pipe roller system into the bucking unit to position the coupling within the tong section. It is very important that both the bucking unit and the pipe be level at this time.

3. The tong is then clamped on the coupling. The centering cylinder should rise until it just contacts the coupling. It should not stop short, nor should it push the coupling upward. If the tubular is excessively heavy, it may be necessary to adjust the setting of the sequence valve to insure the centering cylinder fully extends. As the pressure in the clamping system increases, the other two cylinders should start extending and moving downwards until they contact the pipe. It is important these two cylinders move in sequence so they contact the pipe at the same time. Significant time delays between contact of the two cylinders can push the pipe off center. Timing is easily adjusted by means of two flow control valves located within the tong and two flow controls within the backup. The pipe should still be level after full clamping pressure is applied. The coupling should be centered within the tong at this time.

4. The backup clamping sequence should be identical to the tong. The centering cylinder should rise until it just contacts the pipe. It should not stop short, nor should it contact the pipe with so much force that it cause the backup suspension spring to be compressed as the backup is forced downward, or alternatively, cause light weight tubulars to be picked up. The pipe should be centered within the backup at this time. If the pipe is not level when the backup is clamped on the pipe, you will observe eccentric movement of the pipe, substantial backup movement and quite possibly very wavy torque graphs as the pipe is flexed.

AIR INTENSIFIER

1. For regular settings of 2500 psi use as previously, push handles without using air valves.

2. For High Pressure Operation: Push both handles to the extend position until contact on pipe. Hold for 5 to 10 seconds then release. For 4500 psi setting open both air valves with air compressor running. Close air valves, you will be at 4500 psi.

3. If air pressure is adjusted at maximum pressure, there is a relief valve mounted in each unit hooked to the air pump that will not allow pressure over 4500 psi.

4. Outside gauges will not measure the intensified 4500 psi hydraulic supply pressure, just the 3000 psi. Pressure gauges inside tong and backup will show holding pressure. To adjust from 4500 psi to 3000 psi, the air regulator must be adjusted down.

5. To calibrate air gauge to hydraulic pressure, remove the cover from the tong and close cylinders on pipe. Hydraulic pressure on the inside gauge and air pressure on the regulator gives you the calibration.

For more information, reference Section 11.

CONTROLS and INSTRUMENTATION

Figure 1 depicts a standard Bucking Unit Control Panel arrangement. Figure 2 is a hydraulic schematic of the bucking unit system. Part numbers for components can be found on illustrations. The pressure valves, shown in the schematic, have been set at the factory for proper performance and should not require adjustment under normal conditions. Situations which would dictate adjustments include handling of fiberglass tubulars or other easily collapsed thin wall materials or if steel dies slip at high torques. We recommend you contact the factory for advise before attempting to make any of these adjustments otherwise warranty coverage on the unit may be limited.

A hydraulic compression style load cell and hydraulic torque gauge are optional features on **CLINCHER®** BUCKING UNITS.

CAUTION: The electronic load cell (if supplied by Superior) has been removed for shipping and must be reattached to the right side (same side as control panel) of the backup before operating the unit. In this position it will read torque during makeup operations only. A dummy load cell is attached to the left side of the backup. Should measurement of torque be required during breakout operations, the end user must relocate the electronic load cell and the dummy load cell to the opposite sides of the backup.

A Turns Encoder can be installed (ref Gear Box Assembly Dwg. in Section 9).

DIE INSTALLATION

Insure hydraulic power unit is turned off. Bleed system pressure by moving all control valve levers several times. Remove cap screws and clips from jaws. Insure jaw & die spline surfaces are free of debris or damage and are lightly greased. Install the required dies in the tong and backup by sliding in until they contact the fixed clip. Reinstall clips and cap screws. Tighten cap screws firmly to prevent them from vibrating loose. Do not over tighten. *Note:* The larger Bucking Units require die adapters be installed when using smaller dies. For example, when using the 11 3/4" unit with 5 1/2" casing you must install three 11 3/4" x 7 5/8" die adapters in the tong and backup before installing the 7 5/8" x 6.050" die (required for OD of API coupling) in the tong and the 5.500" die in the backup.

CAUTION: Do not operate the jaws unit without correct dies and the proper size tubular being in the tong and backup.

PRE-JOB UNIT INSPECTION

Connect all hydraulic hoses and insure suction valve is open on power unit reservoir. Energize the hydraulic power unit all it can operate for 10 minutes to warm oil. Operate each valve while monitoring for leaks.

PIPE INSTALLATION

Operate Tong Jaw and Backup Jaw Directional Control Valves (DCV) as labeled on Figure 1 to insure jaws are in the fully open position. Using Tong Rotation DCV, rotate the tong to insure the bottom centering jaw is located at the lowermost point in the head by aligning the paint stripes on the tong with the matching stripes on the frame.

CAUTION: Rotational alignment is a very critical operation as the bottom jaw has controlled stroke to center the pipe in the jaws.

Refer to the hydraulic schematic (Figure 2) for more details regarding the hydraulic circuitry and components.

Manually adjust the spacing between the tong and backup to accommodate the tool joint being torqued. Using pipe handling systems or a crane, carefully install the pipe in the Bucking Unit in a level position. The tubular should be held as close to the unit centerline as is possible. It will be necessary to feed the tubular through the backup and into the tong. Close the tong jaws on the pipe using the Tong Jaw DCV. During the clamping operation you will be able to read the clamping pressure on the system pressure gauge. Release Tong Jaw DCV and allow it to return to its center position. Pressures cannot be monitored when the valves are in the neutral position. Clamping pressure will be trapped within the jaw cylinders by means of pilot operated check valves. Trapping pressure by means of these check valves allows the pressure to be bled off the rotary swivel seals before rotation begins, thus extending the life of the rotary seals.

Note: This unit has been equipped with optional air driven pressure booster pumps to provide enhanced torque capacity when using non-marking aluminum dies. To operate, shift DCV to clamp position until maximum system pressure is achieved. Simultaneously open respective booster pump air control to allow cylinder pressure to build to required 4500 psi. Only a few strokes are required to achieve required pressure. Continued pumping will not over pressurize the system as a pressure relief valve is built into each pump circuit. Actual clamping pressures can be observed by a means of a gauge located on the rear, lower section of the backup or by means of an observation window at the 12 o'clock position on the rotating section.

CONTROLS and INSTRUMENTATION

Visually confirm proper backup position before activating its dies. Close the backup jaws on the pipe using the Backup Jaw DCV. Release Backup Jaw DCV and allow it to return to its center position. The height of the backup assembly has been adjusted at the factory to position its centerline at the same elevation as the tong assembly's centerline and should not require further adjustment.

CAUTION: Activating the jaws or applying torque with improperly closed jaws could result in mechanical damage or injury to personnel. Improper clamping can occur if the pipe is incorrectly positioned within the CLINCHER BUCKING UNIT or if the improper combination of dies and pipe diameters are used.

CONSIDERATIONS WHEN APPLYING TORQUE TO TUBULARS

The application of torque to a tubular by a tong or similar devise requires a backup tong, vise or wrench to generate a reactive torque. When this reactive torque must pass through a single point, such as a load cell, an unbalanced force is created. If the tubular is sufficiently slender (its OD is small relative to its length) or if torques are high, the tubular may be seen to deflect under this bending load. To minimize the consequence of this bending it is important the backup be positioned as closely to the tong as possible.

MAKEUP PROCEDURE

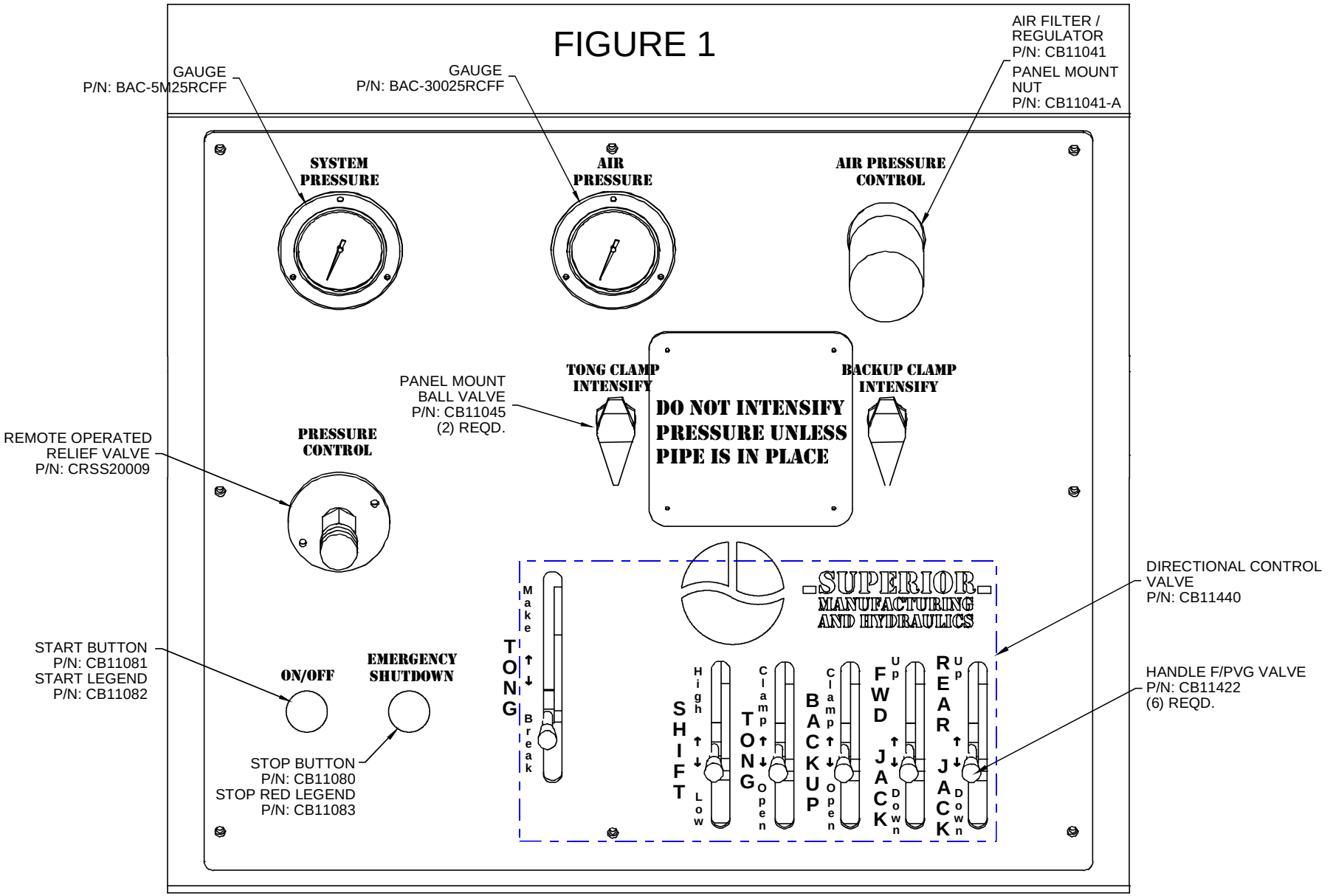
Insure jaws are fully extended and clamped on the pipe. Operate Tong Rotation DCV to makeup (or breakout) joint to required torque. Torque can be monitored using the optional torque gauge or the Data Acquisition System. The computer system features a dump valve which controls the maximum applied makeup torque. Note this dump valve has no effect on breakout torque. Torque can be controlled using the adjustable pressure relief valve on the power unit. Accessories are also available to dump hydraulic pressure and control rotational speed.

Attach crane to tubular (if required) after proper makeup torque has been reached. Use Tong Jaw DCV to fully retract the dies. Carefully remove the tubular from the Bucking Unit. Using Tong Rotation DCV, rotate the tong to insure the bottom centering jaw is located at the lowermost point in the head by aligning the paint stripes on the tong with the matching stripes on the frame. The BUCKING UNIT is now ready for the next tubular operation.

BREAKOUT PROCEDURE

Load cells are to be installed on both sides of the Backup to all measurement of torque in makeup and breakout mode. Operations for breaking out of tubulars are precisely the same as for making up except for the direction of rotation controlled by Tong Rotation DCV.

FIGURE 1



CONTROL PANEL

SUPERIOR Manufacturing & Hydraulics
4225 HWY. 90 EAST
BROUSSARD, LA 70518
(318) 837-8847

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		01/11/06

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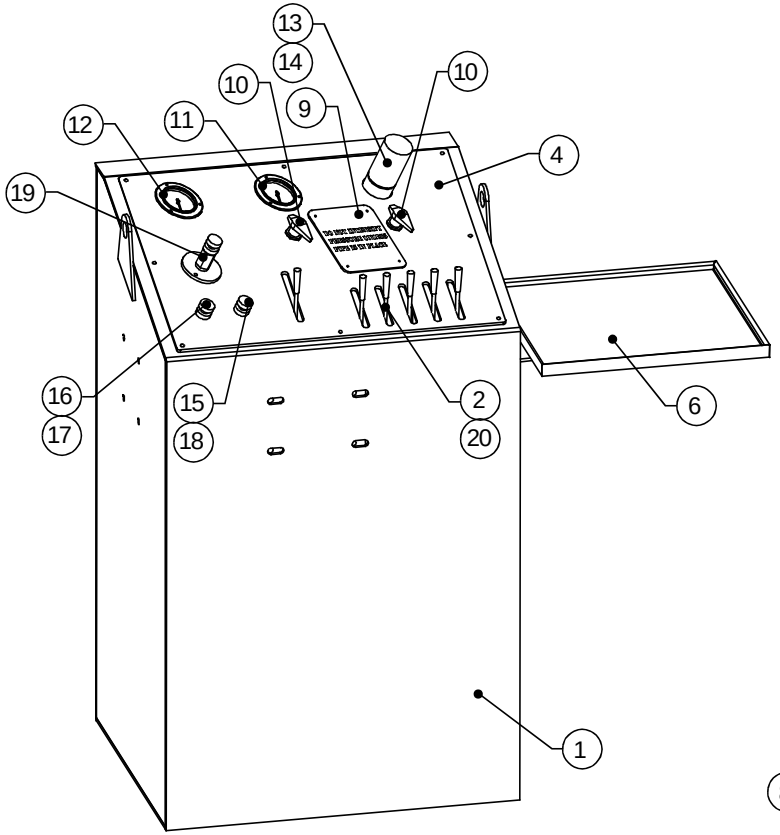
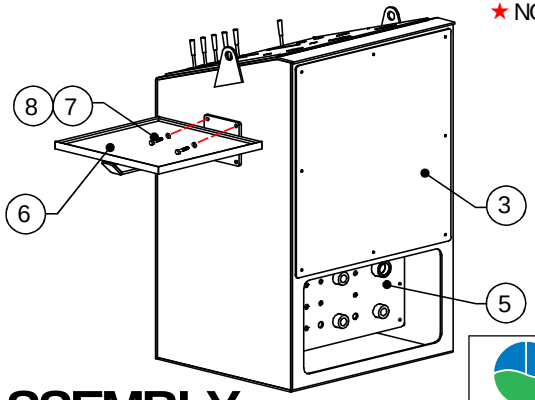


Item #	Qty.	Part Number	Part Name
1	1	CB11410	CONTROL CONSOLE WELDM. W/PIPE JACK CONTROLS
2	1	CB11440	DIRECTIONAL CONTROL VALVE PVG120, (5) PVG32
3	1	CB11410-S3	CONTROL PANEL BACK PLATE
4	1	CB11412	CONTROL PANEL COVER PLATE
5	1	CB11413	CONSOLE BOLT-ON PLATE WELDMENT
6	1	CLEBU1210	TORQUE COMPUTER MOUNT WELDMENT
7	4	1027	3/8" LOCKWASHER
8	4	1048	3/8"-16 x 1 1/4" HHCS
9	1	CB11029	TAG (DO NOT INTENSIFY PRESSURE UNLESS PIPE IS IN PLACE)
10	2	CB11045	PANEL MOUNT BALL VALVE
11	1	BAC-30025RCFF	PANEL MOUNT GAUGE 300 PSI
12	1	BAC-5M25RCFF	PANEL MOUNT GAUGE 0-5000 PSI
13	1	CB11041	AIR FILTER / REGULATOR
14	1	CB11041-A	PANEL MOUNT NUT F/ AIR REGULATOR
15	1	CB11080	STOP BUTTON
16	1	CB11081	START BUTTON
17	1	CB11082	START LEGEND
18	1	CB11083	STOP RED LEGEND
19	1	CRSS20009	PANEL MNT. REMOTE OPR. RELIEF VALVE
20	6	CB11422	HANDLE F/PVG VALVE
21	1	CB11412B ★	CONTROL PANEL COVER W/ LETTERING
22	1	CB11413-S1B ★	CONSOLE BULKHEAD PLATE W/ LETTERING
23	1	CB1175-HOSE-TAGS ★	HOSE LABELS
24	1	KITFIT-30C ★	FITTING KIT
25	1	2070-S KIT ★	HIGH PRESSURE KIT ASSEMBLY

★ NOT SHOWN



CONTROL CONSOLE ASSEMBLY

ASSEMBLY NO. CB11411

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		01/11/06

REF: P:\Manuals\Equip Manuals\Dwgs\CLEBU1500-30\CB11411.wpg

Item	Qty.	Part Number	Description	Location
1	1	CB11440	PVG 120/32 (5) VALVE, TONG CONTROLS	CONSOLE
2	1	CRSS20009	RELIEF VALVE, REMOTE, PANEL MOUNT	CONSOLE
3	1	CB11041	AIR FILTER / REGULATOR	CONSOLE
4	2	CB11045	BALL VALVE, PANEL MOUNT	CONSOLE
5	1	BAC-30025RCFF	GAUGE 300 PSI, PANEL MOUNT	CONSOLE
6	1	CB11048	HYDRAULIC MOTOR, DUAL SPEED	TONG
7	1	CB11043	DUAL SPEED MANIFOLD	TONG
8	1	CLEBU1709	HYDRAULIC SWIVEL	TONG
9	4	CLEBU1660	ROTARY SEALS (4 PCS = 1 SET)	TONG
	1	B3P0-008	CLAMPING MANIFOLD ASSEMBLY (INCLUDES) :	TONG
10	1	17-B3P0-001	CLAMPING MANIFOLD (CLOSED HEAD)	TONG
11	1	17-B3P0-005	RELIEF VALVE	TONG
12	1	17-B3P0-004	PILOT OPERATED CHECK VALVE	TONG
13	1	17-B3P0-003	SEQUENCE VALVE W/ REV CHECK	TONG
14	1	17-B3P0-002	FLOW DIVIDER / COMBINER	TONG
15	3	BAC-5M25RCFF	PRESSURE GAUGE, 0-5000	TONG, BACKUP, CONSOLE
16	2	BULJ4035	M-71 HASKEL PUMP (INTENSIFIER OPTIONAL)	TONG, BACKUP
17	3	BUC5524	PILOT OPERATED CHECK VALVE	BACKUP, JACK
18	1	BULJ4036	RELIEF VALVE	BACKUP
18A	1	BULJ4037	RELIEF VALVE SPRING KIT (WHITE)	BACKUP
19	1	CB11044	DUAL PILOT CARTRIDGE VALVE	TONG
20	1	2070	DUMP VALVE	CONSOLE
	1	58058-S	SOLENOID VALVE NOR. CLOSED	CONSOLE
21	2	CM4565	CHECK VALVE	TONG, BACKUP
22	2	CB2023	CYLINDER 4" BORE, 8" STROKE, 2 1/4" ROD	JACK

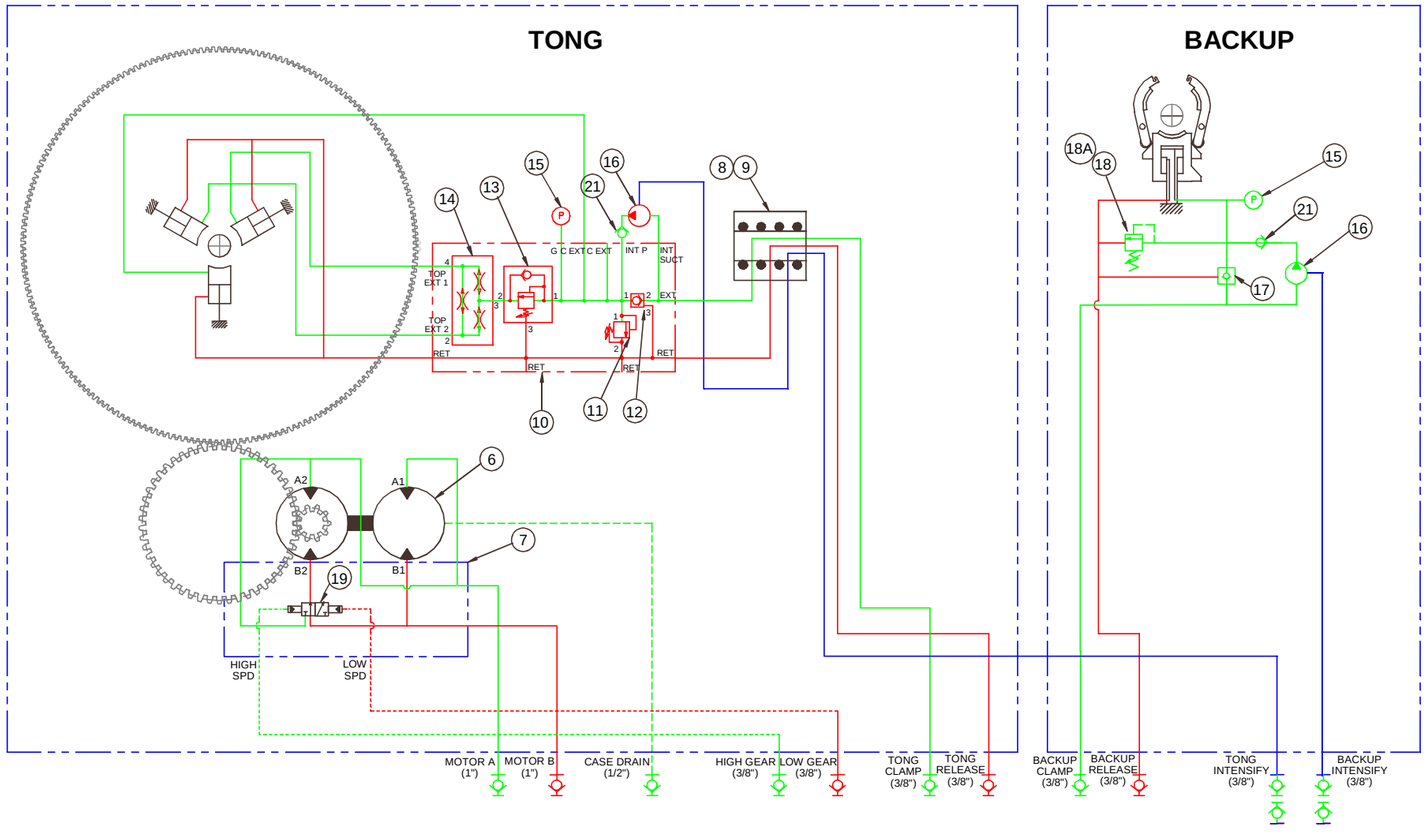

FIGURE 2

BUCKING UNIT *Type Three*

HYDRAULIC SCHEMATIC

INCLUDES JACK/ROLLER

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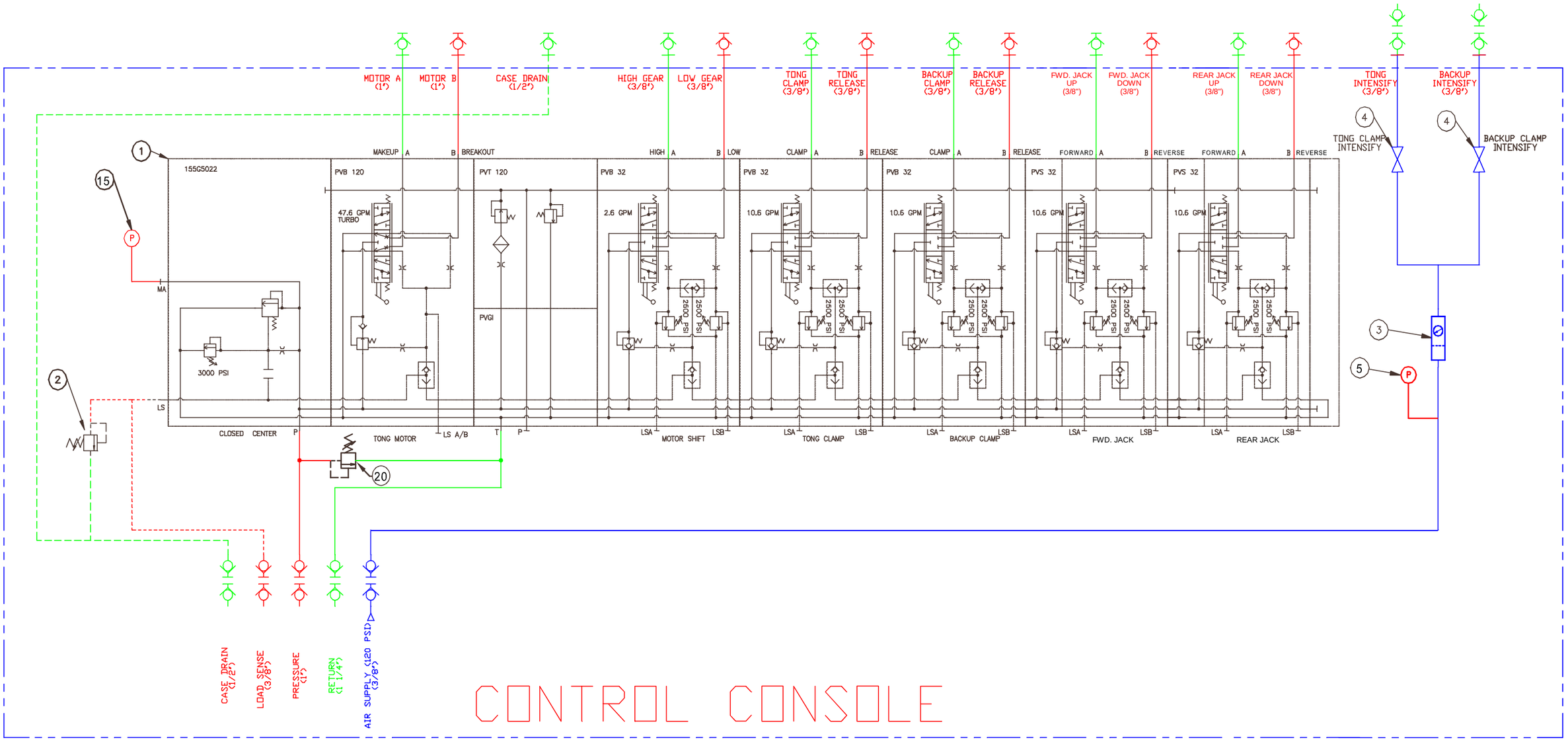

FIGURE 2

BUCKING UNIT *Type Three*

HYDRAULIC SCHEMATIC

INCLUDES JACK/ROLLER

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		01/09/06

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Item	Qty.	Part Number	Description	Location
1	1	CB11440	PVG 120/32 (5) VALVE, TONG CONTROLS	CONSOLE
2	1	CRSS20009	RELIEF VALVE, REMOTE, PANEL MOUNT	CONSOLE
3	1	CB11041	AIR FILTER / REGULATOR	CONSOLE
4	2	CB11045	BALL VALVE, PANEL MOUNT	CONSOLE
5	1	BAC-30025RCFF	GAUGE 300 PSI, PANEL MOUNT	CONSOLE
6	1	CB11048	HYDRAULIC MOTOR, DUAL SPEED	TONG
7	1	CB11043	DUAL SPEED MANIFOLD	TONG
8	1	CLEBU1709	HYDRAULIC SWIVEL	TONG
9	4	CLEBU1660	ROTARY SEALS (4 PCS = 1 SET)	TONG
	1	B3P0-008	CLAMPING MANIFOLD ASSEMBLY (INCLUDES) :	TONG
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12	1	17-B3P0-004	PILOT OPERATED CHECK VALVE	TONG
13	1	17-B3P0-003	SEQUENCE VALVE W/ REV CHECK	TONG
14	1	17-B3P0-002	FLOW DIVIDER / COMBINER	TONG
15	3	BAC-5M25RCFF	PRESSURE GAUGE, 0-5000	TONG, BACKUP, CONSOLE
16	2	BULJ4035	M-71 HASKEL PUMP (INTENSIFIER OPTIONAL)	TONG, BACKUP
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21	2	CM4565	CHECK VALVE	TONG, BACKUP
22	2	CB2023	CYLINDER 4" BORE, 8" STROKE, 2 1/4" ROD	JACK

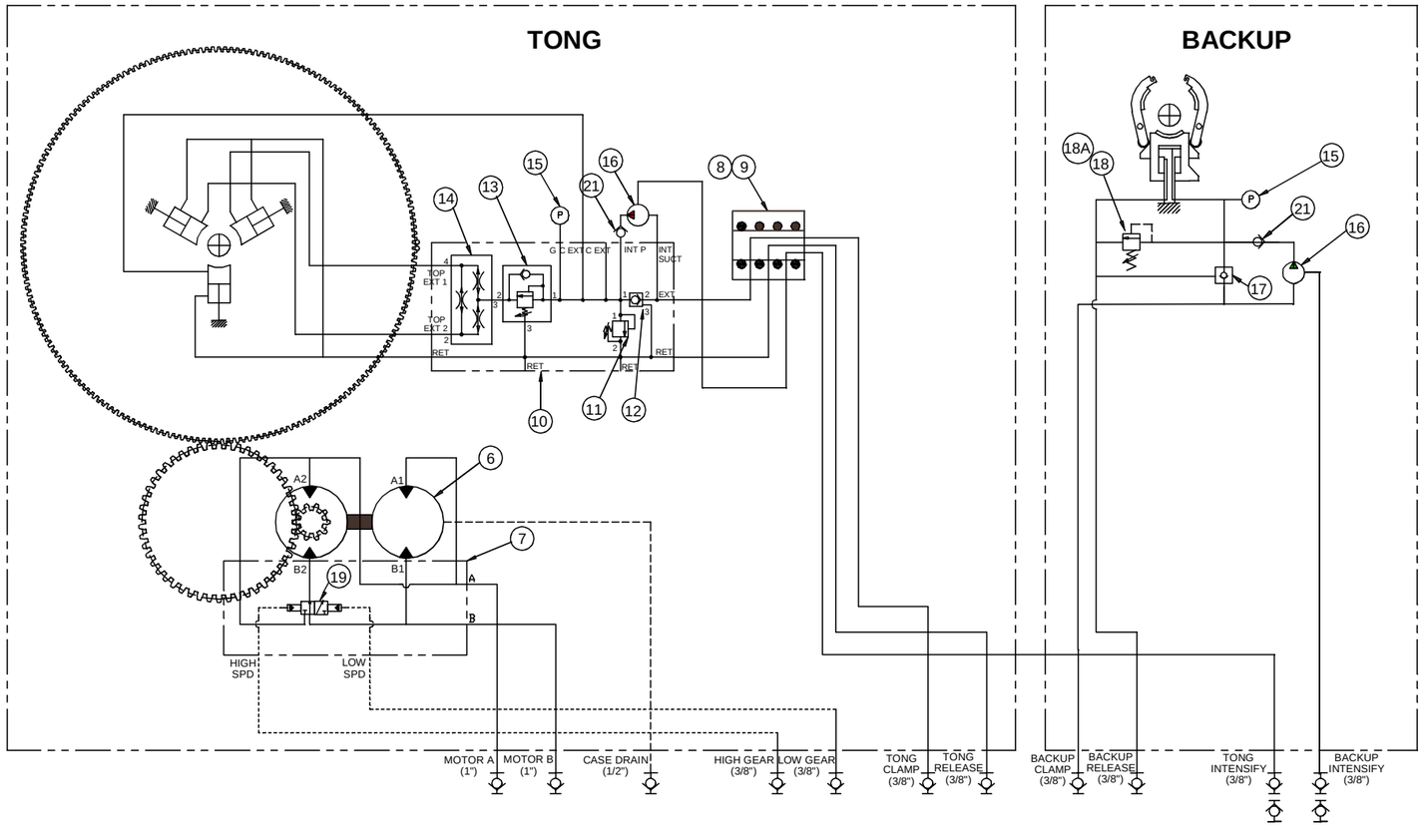

FIGURE 2

BUCKING UNIT *Type Three*

HYDRAULIC SCHEMATIC

INCLUDES JACK/ROLLER

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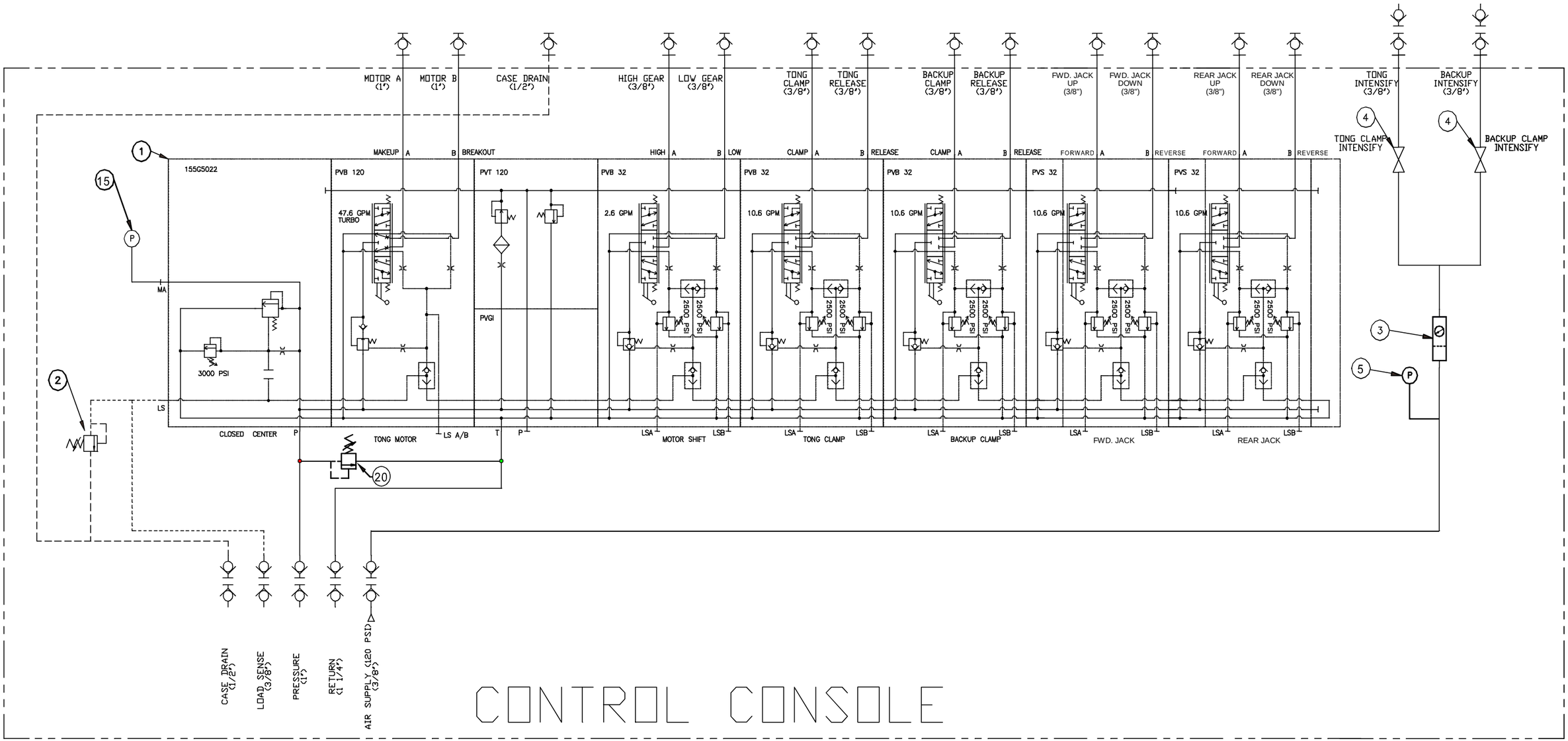

FIGURE 2

BUCKING UNIT *Type Three*

HYDRAULIC SCHEMATIC

INCLUDES JACK/ROLLER

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		01/09/06

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Documentation INT-10/x

Functional description

The INT-10 is a signal converter which converts standardized industrial signals into a potentiometric signal, as is required by a Danfoss proportional valve.
The INT-10 can be delivered in four models, depending on the control signal:

Model	Control signal
INT-10/2	0..20 mA
INT-10/3	0..10 V
INT-10/4	4..20 mA
INT-10/5	-10..+10 V

Connecting information

The INT-10 and the Danfoss valve share the same power supply, just like a common potentiometer.
For the INT-10 the same rules are valid for connecting cables as it is with a potentiometer (see connection diagram at the back of this page).
The supply cables will go **directly** from the battery to the Danfoss valve and then **from** the Danfoss valve to the INT-10. Further the + and - wires between the Danfoss proportional valve and the INT-10 have to be the same diameter and the same length.

Specifications

Output voltage	Ratiometric output, min. 25% and max 75% of the supply voltage
Limitation output	Minimum > 13% and maximum < 87% of the supply voltage
Response time	2 ms maximum
Linearity	Less than 1% deviation
Supply Voltage	9 - 30 VDC (max. 200 mA)
Ambient temperature	-10 to +50 °C
Mounting	On a DIN rail
Cable connections	with M3 screws
Dimensions	l x w x h : 77 x 32.5 x 114 mm

Guarantee

During a period of 12 months production and component failures are guaranteed.
Exchanging a defect INT-10 will be shipped f.o.b.
Guarantee will be void at injudicious use, opening of the case, usage out of specifications and mechanical damage, such at the judgement of Tildesign BV.

Tildesign bv
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NL-3893 CD Zeewolde
The Netherlands
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Fax +31 – (0)36-522 13 14
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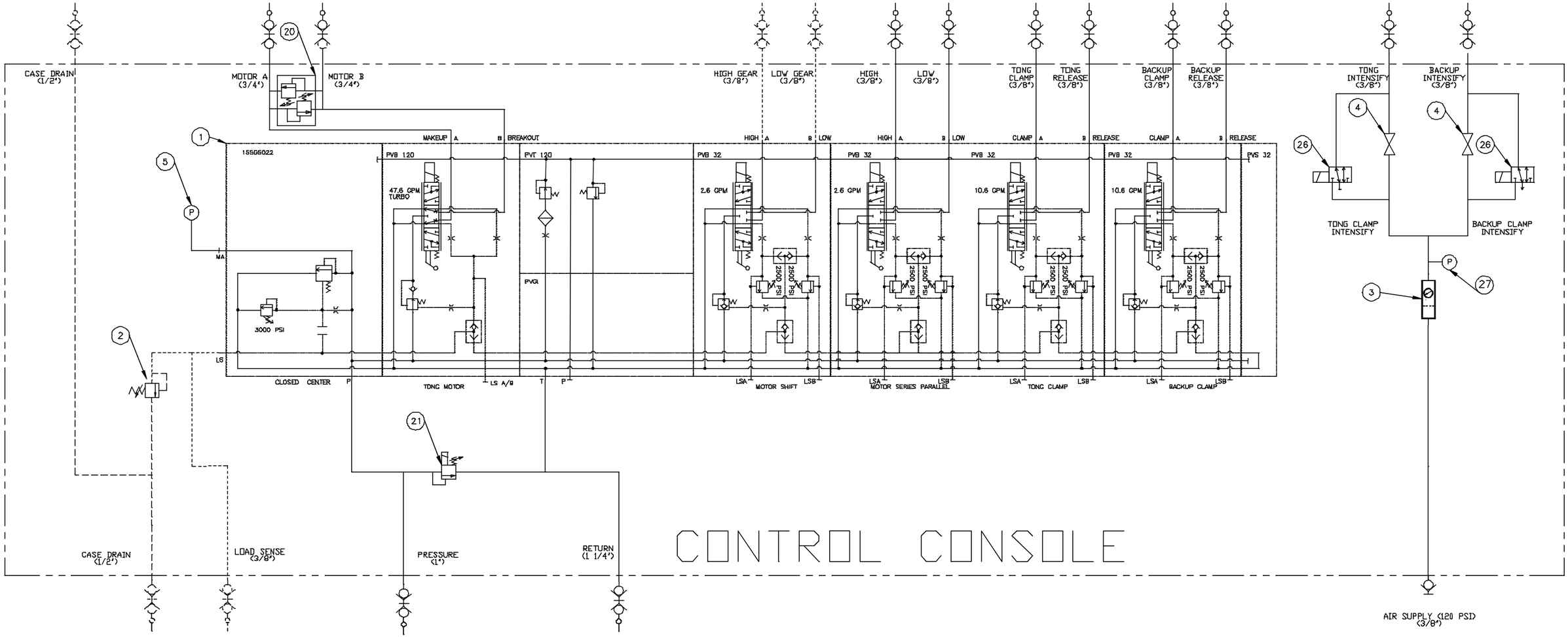
Zeewolde, The Netherlands



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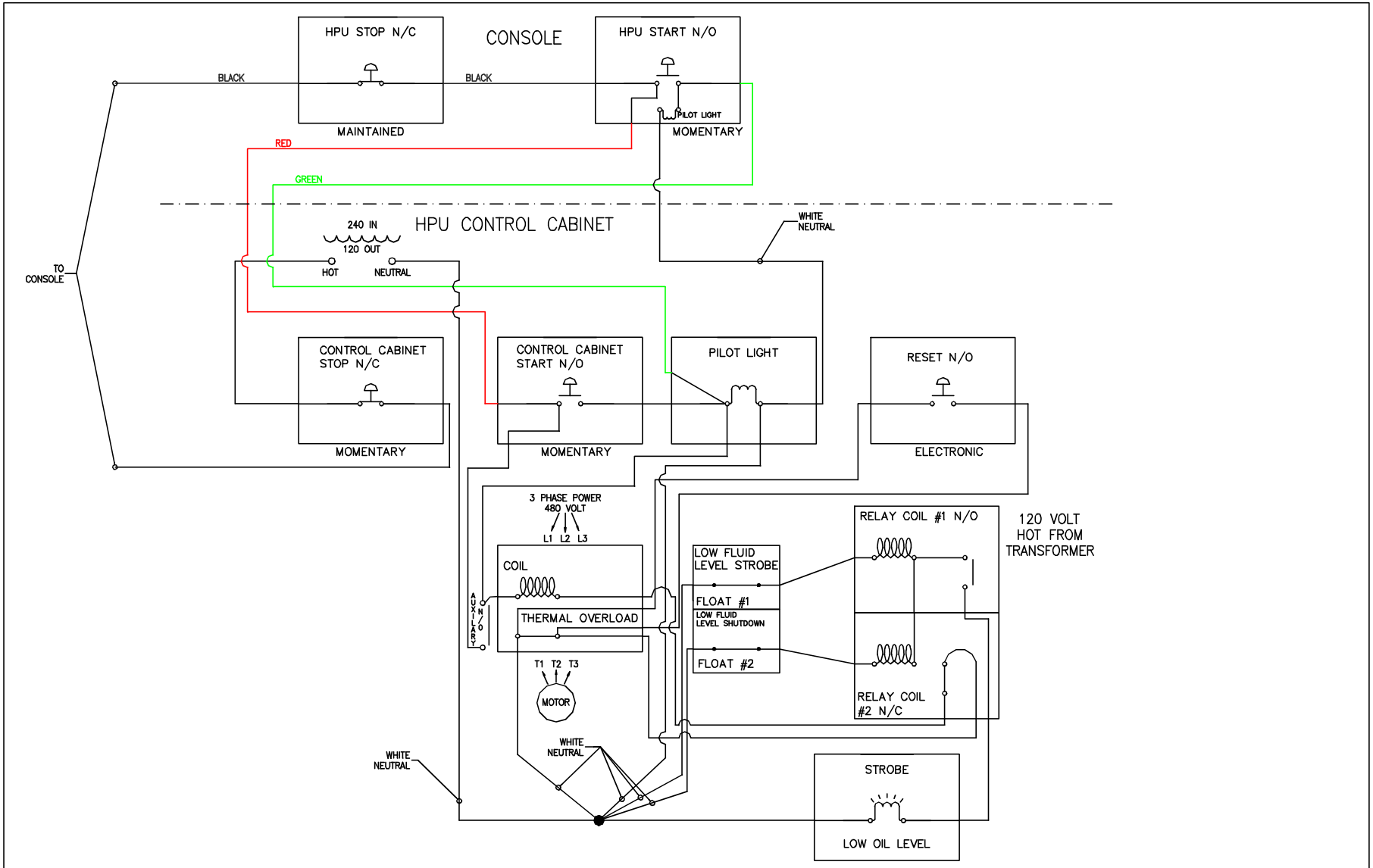

Rev.	By	Date	ECN#	Description of Revision
6				
5				
4				
3				
2				
1				

1/8 LS STAMP P/N & MATL. P.O. ON NON-CRITICAL SURFACE

ETCH P/N & MATL. P.O. ON NON-CRITICAL SURFACE

TAG P/N & MATL.P.O.

UNLESS OTHERWISE SPECIFIED TOLERANCES ARE R8

2 PLACE DEC. ±.020	3 PLACE DEC. ±.005	FRACTIONS ± 1/16	ANGLES ± .5°	SURFACE 250	FLATNESS AR PL ± .015 per foot

1. Dimensions are in inches
2. Remove burrs & sharp edges with 1/64x45°max.
3. Machined fillet radii are 1/32
4. Normality,Squareness & parallelism of machine surfaces are .002 per inch, to a max of .012 inches for a single surface.
5. Machine diameters on a common centerline must be concentric within .005 T.I.R & unmachined diameters concentric within .032 T.I.R

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1 =Revision No. X =STAMP,ETCH,TAG =Machine Zero

1.000 = Critical Dimension 100% Inspection Required

SHEET 1 of 1

SUPERIOR Manufacturing & Hydraulics
4225 HWY.90 E
BROUSSARD,LA 70518
(337) 837-8847

PART NAME: ELECTRICAL SCHEMATIC

PART #:

DRAWN BY: MFG

APPROVED BY: DSB

CHK BY: NM DATE: 4/9/07

REF: SEE NOTE

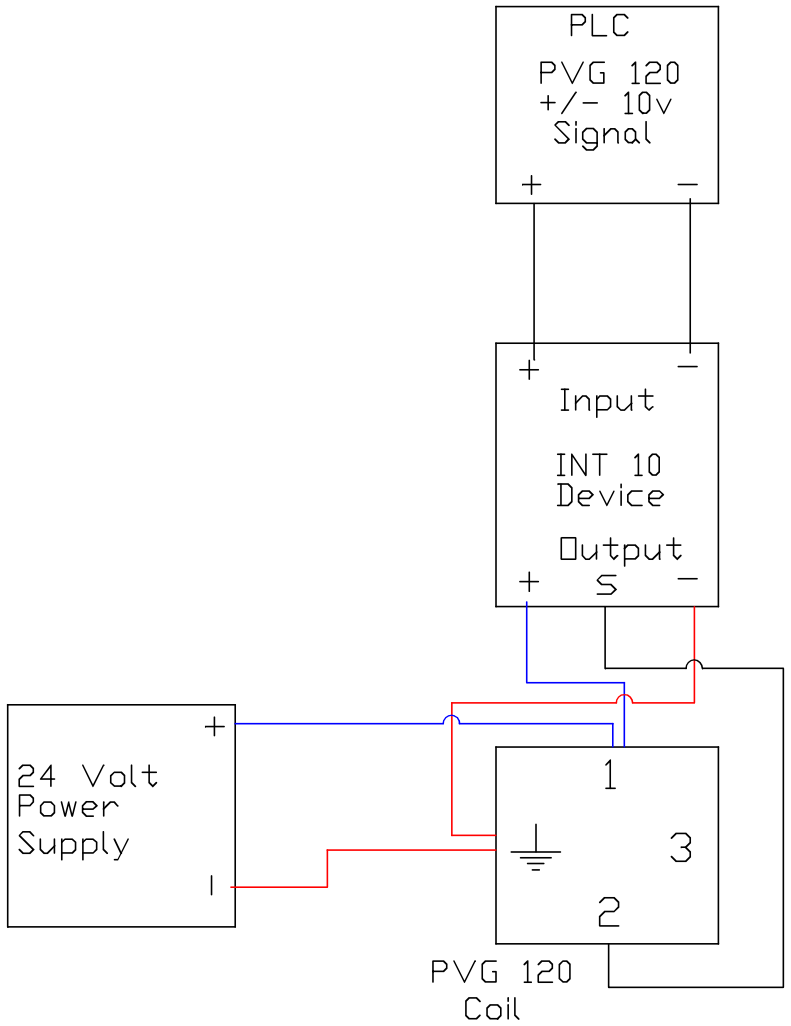
MATERIAL SPECIFICATION

Matl.Req:

Initial Condition:

Alternate Matl:

H.T Instructions: Case Depth:



Note: The wire length and dia. from power supply to the coil and coil to INT/10 device need to be the same.

Rev.	By	Date	ECN#	Description of Revision
6				
5				
4				
3				
2				
1				

1/8 LS STAMP P/N & MATL. P.O. ON NON-CRITICAL SURFACE

ETCH P/N & MATL. P.O. ON NON-CRITICAL SURFACE

TAG P/N & MATL.P.O.

UNLESS OTHERWISE SPECIFIED TOLERANCES ARE — R8

2 PLACE DEC.	3 PLACE DEC.	FRACTIONS	ANGLES	SURFACE	FLATNESS AR PL.
±.020	±.005	± 1/16	± .5°	250	± .015 per foot

1. Dimensions are in inches
2. Remove burrs & sharp edges with 1/64x45°max.
3. Machined fillet radii are 1/32
4. Normality,Squareness & parallelism of machine surfaces are .002 per inch, to a max of .012 inches for a single surface.
5. Machine diameters on a common centerline must be concentric within .005 T.I.R & unmachined diameters concentric within .032 T.I.R

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△1 ⬡1 =Revision No. (X) =STAMP,ETCH,TAG ⊕ =Machine Zero

1.000 = Critical Dimension 100% Inspection Required

SHEET 1 of 1

SUPERIOR Manufacturing & Hydraulics
4225 HWY.90 E
BROUSSARD,LA 70518
(337) 837-8847

PART NAME: Electronic proportional controls

PART #:

DRAWN BY: W. LeBlanc

APPROVED BY: DAN B

CHK BY: NM DATE: 08/14/07

REF: p:PVG120_Prop_Ctrl.DWG

MATERIAL SPECIFICATION

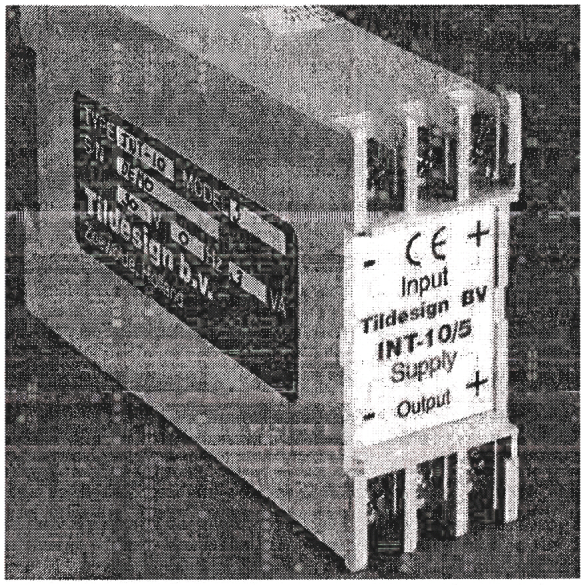
Matl.Req:

Initial Condition:

Alternate Matl:

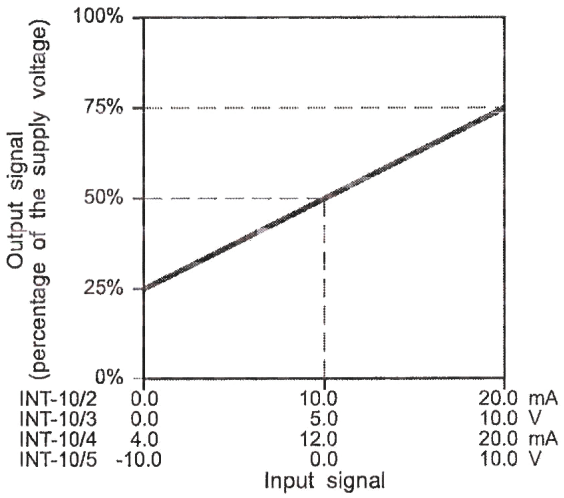
H.T Instructions: Case Depth:

Danfoss valve control



The control signal, can be produced by a PLC, an industrial control computer or a sensor.

The INT-10 offers you the possibility to control a Danfoss hydraulic proportional valve through a 0..10 Volt, 0..20 mA, 4..20 mA or a -10..10 Volt signal.

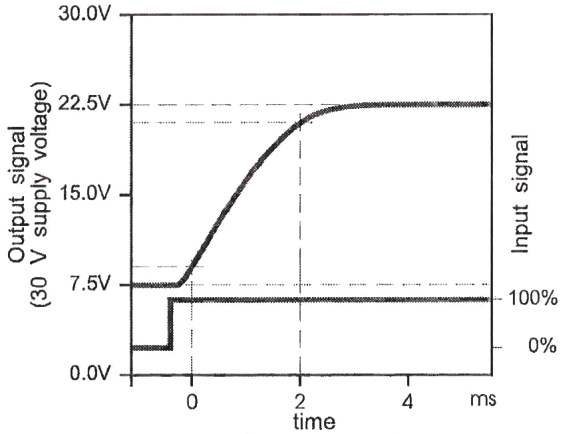


Transfer characteristic

The INT-10 converts this control signal to a corresponding potentiometer range, so that the Danfoss proportional valve will be controlled correctly.

In the first characteristic, the output signal is plotted as a function of the input signal.

The second characteristic, reflects the response time, measured between 10% and 90% of the maximum values.



Response time

Specifications:

Input signals (galvanically isolated):

- 0..20 mA (INT-10/2)
- 0..10 Volt (INT-10/3)
- 4..20 mA (INT-10/4)
- -10..10 Volt (INT-10/5)

Output signal:
- potentiometer output, min. 25% and max. 75% of supply voltage
- output limiting : min. > 13% and max. < 87% of supply voltaqe

Response time : 2 ms max.
Linearitity : better than 1% deviation
Supply voltage : 9..30 VDC (max 200 mA)
Mounting : on DIN rail
Cable connections : M3 screws
Dimensions : l x w x h : 77 x 32.5 x 114 mm

order codes	input signal
INT-10/2	0..20 mA
INT-10/3	0..10 Volt
INT-10/4	4..20 mA
INT-10/5	-10..10 Volt

Tildesign MICRO ELECTRONICS
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P.O. Box 1309
3890 BC ZEEWOLDE
Phone: +31 36 522 11 34
Fax : +31 36 522 13 14
THE NETHERLANDS

Documentation INT-10/x

Functional description

The INT-10 is a signal converter which converts standardized industrial signals into a potentiometric signal, as is required by a Danfoss proportional valve.
The INT-10 can be delivered in four models, depending on the control signal:

Model	Control signal
INT-10/2	0..20 mA
INT-10/3	0..10 V
INT-10/4	4..20 mA
INT-10/5	-10..+10 V

Connecting information

The INT-10 and the Danfoss valve share the same power supply, just like a common potentiometer.
For the INT-10 the same rules are valid for connecting cables as it is with a potentiometer (see connection diagram at the back of this page).
The supply cables will go **directly** from the battery to the Danfoss valve and then **from** the Danfoss valve to the INT-10. Further the + and - wires between the Danfoss proportional valve and the INT-10 have to be the same diameter and the same length.

Specifications

Output voltage	Ratiometric output, min. 25% and max 75% of the supply voltage
Limitation output	Minimum > 13% and maximum < 87% of the supply voltage
Response time	2 ms maximum
Linearity	Less than 1% deviation
Supply Voltage	9 - 30 VDC (max. 200 mA)
Ambient temperature	-10 to +50 °C
Mounting	On a DIN rail
Cable connections	with M3 screws
Dimensions	l x w x h : 77 x 32.5 x 114 mm

Guarantee

During a period of 12 months production and component failures are guaranteed.
Exchanging a defect INT-10 will be shipped f.o.b.
Guarantee will be void at injudicious use, opening of the case, usage out of specifications and mechanical damage, such at the judgement of Tildesign BV.

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Zeewolde, The Netherlands

MAINTENANCE

CLINCHER® recommends that owners of **CLINCHER®** Hydraulic Power Tongs, Backups, **CHROMEMASTER™**, Bucking Units, and accessories adopt a regularly scheduled maintenance program. Implementation of this type of program offers several benefits. First, you increase the life of your equipment. Second, you may find a problem before it escalates to a costly repair or down time on the job, and most importantly, prevent injury to operating personnel.

A major inspection (described at the end of this section) should be carried out if equipment is suspected to have been damaged during transit or is to be mobilized to a remote location where maintenance operations are difficult to carry out.

ROUTINE MAINTENANCE

Cleaning - Upon return from each and every job, perform the following:

A) Pre-wash unit to remove majority of dirt and grease build up as to allow removal of dies, and inspection of overall condition of unit.

B) Remove and inspect dies from tong and backup. Note any missing or damaged die retainers, and or die retainer bolts.

C) Clean and inspect jaws for damage or excessive wear. Lubricate splines and all grease zerts.

D) Inspect all hoses for wear, replace as necessary.

E) Inspect backup hanger assembly to assure all parts are in operating condition.

F) Install dies of a size needed for testing purposes, and attach hydraulic power unit to Bucking Unit. Before energizing power unit make certain no one is working on Bucking Unit and all tools and parts are removed from the tong and backup assemblies.

G) Insert test mandrel of the exact same size as the dies which are installed in the tong and backup assemblies.

   Caution: Testing the function of the backup without the proper size dies installed and/or without the proper sized mandrel in place, you risk serious damage to the back-up cylinder.

H) After power unit has reached operating temperature, operate the backup control valve and close backup around test mandrel using sufficient flow and pressure to clamp mandrel and maintain pressure to backup. (Recommended operating pressure of 3,000 P.S.I.) Control Panel pressure gauge should match Power Unit System operating pressure.

I) While maintaining pressure on backup visually inspect hoses, stainless steel lines, fittings, etc., for seepage of hydraulic fluid. Repair or replace parts causing leaks.

J) If at this time your backup is functioning correctly, open and close unit several times to insure consistent operation.

K) With the proper dies installed in the tong and backup, and test mandrel locked in the backup, operate tong DCV through several cycles of locking and releasing. While maintaining pressure on Tong Assembly, visually inspect hoses, stainless steel lines, fittings, etc., for seepage of hydraulic fluid. Repair or replace parts causing leaks.

L) Operate Rotational DCV to apply torque to test mandrel up to value required for tubulars to be made up or broken out. While maintaining pressure on motor visually inspect hoses, stainless steel lines, fittings, etc., for seepage of hydraulic fluid. Repair or replace parts causing leaks.

M) **Recommended lubrication schedule performed after completion of each job.** Lubricate all externally accessible grease zerts. Note there are grease zerts for lubricating the cylinders which slide within the tong and backup assemblies which can only be accessed after removing the covers from these assemblies. Check fluid levels in hydraulic power unit reservoir, chain drive case and gear reducer.

N) Inspect hydraulic fluid for foreign material and contaminants. Filter or replace. You must filter or replace entire system including power unit tank and lines along with tong to insure all contaminants are removed.

ANNUAL MAJOR MAINTENANCE

Inspection and Repair

Routine preventative maintenance will significantly extend the operating life of your equipment, reduce operating cost, and avoid downtime. **CLINCHER®** recommends a program of frequent routine inspection and if equipment is suspected to have been damaged during transit or is to be mobilized to a remote location where maintenance operations are difficult to carry out, perform the following:

A) Visually inspect components on Bucking Unit and Power Unit, which could possibly have been damaged either during operation or transit.

B) Check test date. Ensure that a load test and inspection was carried out within the last 9 months.

C) Remove motor and valve assembly from the Bucking Unit.

MAINTENANCE

D) Check motor seal. Apply hydraulic power, run the motor and visually check the motor seal for any signs of leakage.

E) Check gear reducer per manufacturers specifications.

F) Remove covers from Tong and Backup Assemblies. Inspect hydraulic hoses and components for leaks. Lubricate internal grease zerts.

G) Check condition of control valve spools. Activate valves and check for any sign of wear, pitting or scoring of the chrome surface of the spools. If the spool is damaged in any way, the complete section must be changed out as spools are not interchangeable.

H) Remove covers and inspect chain and sprockets for wear or excess slack. (Refer to Chain Adjustment.)

I) Check condition of all hydraulic hoses and fittings. Visually inspect all hydraulic hoses fitted to the tong and in the backup for any signs of leaks, cuts, or wear.

J) Reinstall all parts which were removed for inspection and/or damage. Connect to hydraulic power supply and function test operation. Torque test utilizing appropriate dies and test mandrel.

K) Sample power unit fluid and have processed for contaminants. Replace return filter according to manufacturer's specifications.

L) Lubricate tong and backup according to maintenance schedule preceding this section.

M) Paint, remembering to mask off surfaces not intending to paint with grease or masking tape.

N) Complete dated inspection report giving details of all duties performed along with complete list of items replaced.

CHAIN ADJUSTMENT

When the chains are removed from the machine and laid out, both chains should be the same length. If they are not, one has been stretched and both must be replaced.

When the chains are installed in the unit and tightened correctly, both chains on the driving side should have the same amount of tension. Note: We use a double strength chain. Half links cannot be used with this chain, use only master links when installing these chains. Do not attempt to remove all slack from both sides of the chains. Movement on the slack side of 3/8 to 3/4 inch at the middle of the slack section is acceptable.

Excessive chain tension can cause bronze bushings to become excessively worn. You can use a feeler gauge to determine the amount of clearance between the rotating hub and the ID of the bushings.

The amount of slack on the non-driven side should be the same for both chains. If this is not the case and both chains are the same length, then you may have misalignment between the centerline of the rotating tong section and the centerline of the drive shaft. Misalignment must be removed to insure uniform load distribution in both chains. Use the tension adjustment bolts to correct this condition.

When properly aligned and tensioned, chains will have an acceptable safety factor. You should avoid shock loading by gradually applying and releasing loads.

TROUBLE SHOOTING

HYDRAULIC SYSTEM

Hydraulic Pump Making Excessive Noise:

	Problem	Solution
A)	Restricted or clogged intake line	Clean line, check for contamination.
B)	Contaminated fluid	Flush system change fluid.
C)	Restricted vent	Clean or replace air vent.
D)	Air in fluid	Check for leaks and be certain fluid suction in tank is well below hydraulic fluid in reservoir.
E)	Damaged or worn parts	Repair or replace damaged parts, check fluid for contamination.
F)	Excessive RPM (I/C engines only)	Check PTO, gears and recommended speed to assure proper pump is in-stalled for operation.
G)	Increased friction	Make sure pump has been assembled using correct torque values.
H)	Damaged or worn relief valve	Replace relief valve.
I)	Damaged or worn check valve	Replace check valve.
J)	Restricted discharge	Check to make sure relief valve is set to proper pressure.
K)	Valve system restricted	Inspect and repair or replace defective parts, check system for contamination.

Excessive Wear to Hydraulic Components:

	Problem	Solution
A)	Fluid contamination	Flush fluid system, replace with new fluid.
B)	Components misaligned	Inspect and realign
C)	High operating pressures	Gauge and set to proper pressure.
D)	Exhausted fluid (depletion of additives)	Flush fluid system, replace with new fluid.
E)	Air in fluid	Check for leaks, and be certain fluid suction in tank is well below hydraulic fluid in reservoir.

TROUBLE SHOOTING

HYDRAULIC TONG SECTION

Problem	Solution
A) Shortened bearing life	Check alignment, insure proper lubrication to non-sealed bearings.

Slow Tong Speed:

Problem	Solution
A) Restricted supply line	Clear supply line and check intake on reservoir.
B) Low fluid level	Add fluid to proper volume.
C) Air leak	Locate and repair leak.
D) Pump speed insufficient	Assure proper pump speed for application.
E) Damaged or worn equipment	Isolate pump and check pressure to determine whether motor or pump is defective. Repair or replace defective part.
F) Pump not primed	Check fluid viscosity and restrictions of intake line. Replace fluid if inadequate for operating temperature.
G) Low or no flow from supply line	Check to assure couplings are securely fastened.
H) Hydraulic bypass valve malfunction	Inspect. Adjust unloading pressure. Replace or repair as necessary.

Insufficient Torque:

Problem	Solution
A) Relief valve malfunctioning	Relief set too low, broken valve spring, contamination or defective seals.
B) Damaged or worn pump parts	Inspect, repair or replace.
C) Slow pump speed	Assure proper pump speed for application.
D) Improper system fluid	Check fluid viscosity and replace fluid if inadequate for operating temperature.
E) Directional control valve set improperly	Check relief and directional control valve. Neutral should return slightly to reservoir.
F) Damage to motor	Inspect, repair or replace.
G) Restriction of supply line, excessive back pressure	Check to assure couplings are securely fastened.
H) Defective gauge or load cell	Inspect, repair or replace. Assure unit has been calibrated to proper arm length. NOTE: When using **CLINCHER®** integral backup system, it is the length of backup arm, NOT the tong arm length.

TROUBLE SHOOTING

Failure to Grip Tubulars:

	Problem	Solution
A)	Jaws move out from neutral, but fail to penetrate	Inspect die size and replace with correct dies for pipe. Wrong size dies for tubular.
B)	Jaws fail to move out of neutral	Inspect and replace defective cylinders for debris or damage. Remove rust and debris from jaws, and jaw pockets. Repair, replace and lubricate as needed.
C)	Tong will not release from tubular	Inspect Directional Control Valves.
D)	Motor runs but Tong does not rotate	Inspect and replace defective chain, sprocket or gear reducer.
E)	Tong binds under light load	Inspect and replace defective parts. Damaged hub or bearings.
F)	Tong rotates while control lever is in neutral	Replace control valve.
G)	Hydraulic fluid leaking from motor	Replace motor shaft seal.

HYDRAULIC BACKUP SYSTEM

Backup Fails to Hold Tubular:

	Problem	Solution
A)	Incorrect die for size tubular	Check pipe O.D. and match die size to pipe O.D.
B)	Dies have material compacted in tooth area	Clean dies with wire brush and inspect for worn teeth. Replace with new dies if necessary.
C)	Power unit pressure set incorrectly	Inspect relief valve on power unit to make sure enough system pressure is being delivered to backup.
D)	Counter balance valve not holding pressure	Remove side plates on backup. Bench test and replace the counter balance valve defective.
E)	Internal leakage in backup cylinder	Disconnect lines and bench test cylinder. Repair or replace as necessary.
F)	Jaws will not retract	Counter balance valve is stuck. Replace counter balance valve.
G)	External leakage of cylinder	Repair or replace cylinder.
H)	Control valve set to neutral, but jaws extend	Inspect control valve for damage and/or incorrect spool. Repair or replace as necessary.

OPTIONS AND ACCESSORIES

OPTIONAL Features and Equipment - Several customer specified options are available including:

Maximum diametrical gripping capacity
Maximum backup travel distance
Maximum torque rating
Maximum rotational speed and optional two speed motors
Types of power units
Elevation control systems
Hydraulic load cell and torque gauge
Electronic data acquisition/control systems
Hydraulic load control
Hydraulic speed control
Remotely actuated control valve system
Pipe handling systems
Removable, swiveling control panel

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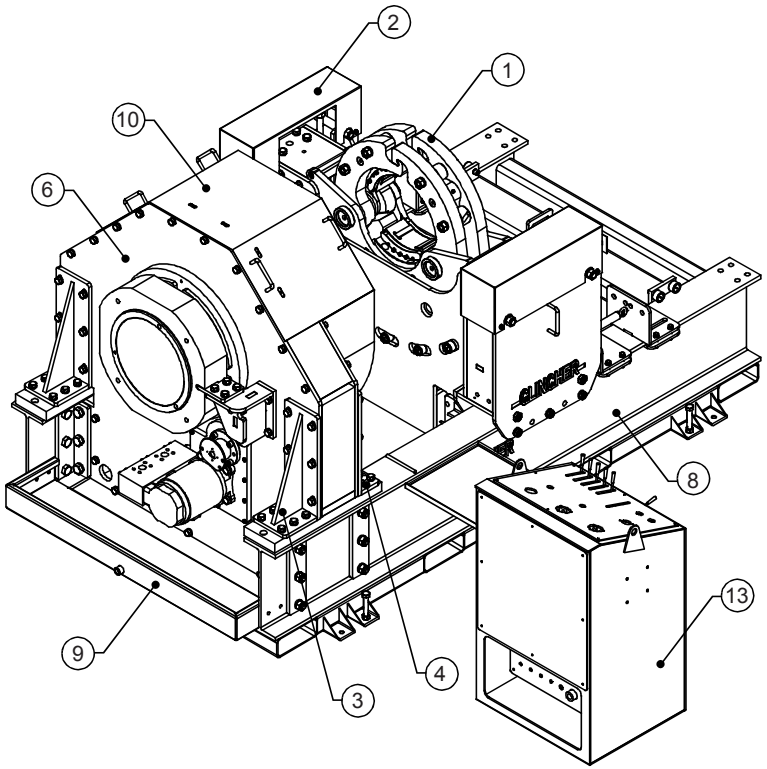

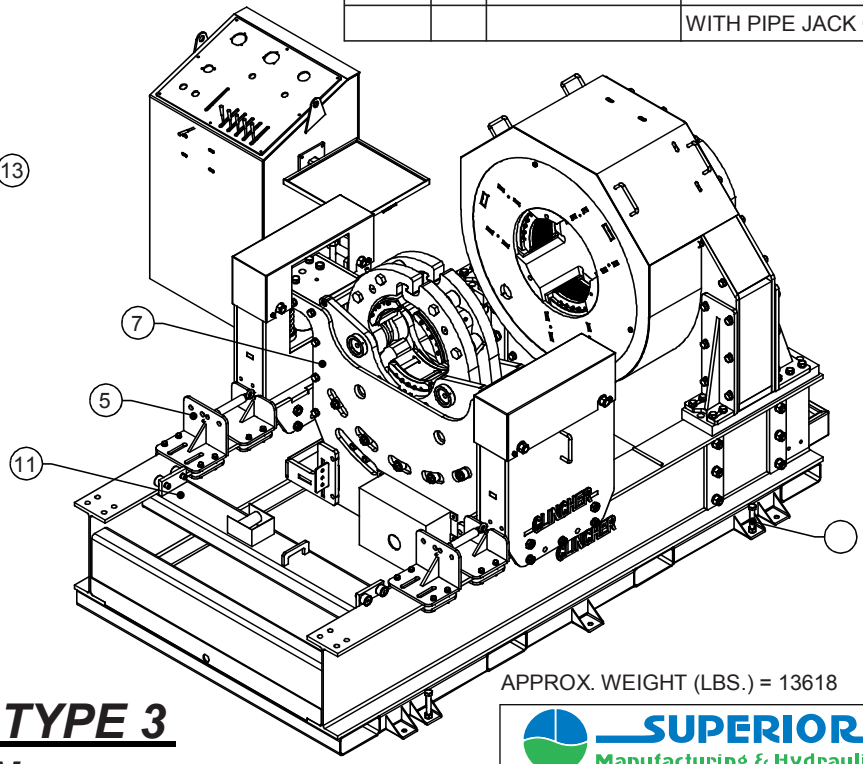

Item #	Qty.	Part Number	Part Name
1	1	BUCS15000-01	15" LJ DRILL PIPE BACKUP ASSEMBLY
2	2	CLEBU1536	CARRIAGE ASSEMBLY
3	2	CB22013	FRONT TONG MNT. BRACKET ASSEMBLY
4	2	CB22025	REAR TONG MNT. BRACKET ASSEMBLY
5	1	CB2312	CARRIAGE SPRING RETRAC./STOP ASSY.
6	1	CLEBU1501	TONG ASSEMBLY
7	1	CLEBU1509	15" BACKUP HOUSING ASSEMBLY
8	1	CLEBU1512	FRAME WELDMENT
9	1	CLEBU1513	BOLT-ON TRAY
10	1	CLEBU1521	COVER WELDMENT
11	1	CLEBU1523	HOLD DOWN STRAP ASSEMBLY
12	4	1169	3/4"-10 x 5" HHCS
13	1	CB11411	CONTROL CONSOLE ASSEMBLY
			WITH PIPE JACK CONTROLS

APPROX. WEIGHT (LBS.) = 13618

15" BUCKING UNIT - *TYPE 3*
OVERALL VIEW

ASSEMBLY NO. CLEBU1500-30

SUPERIOR Manufacturing & Hydraulics
4225 HWY. 90 EAST
BROUSSARD, LA 70518
(318) 837-8847

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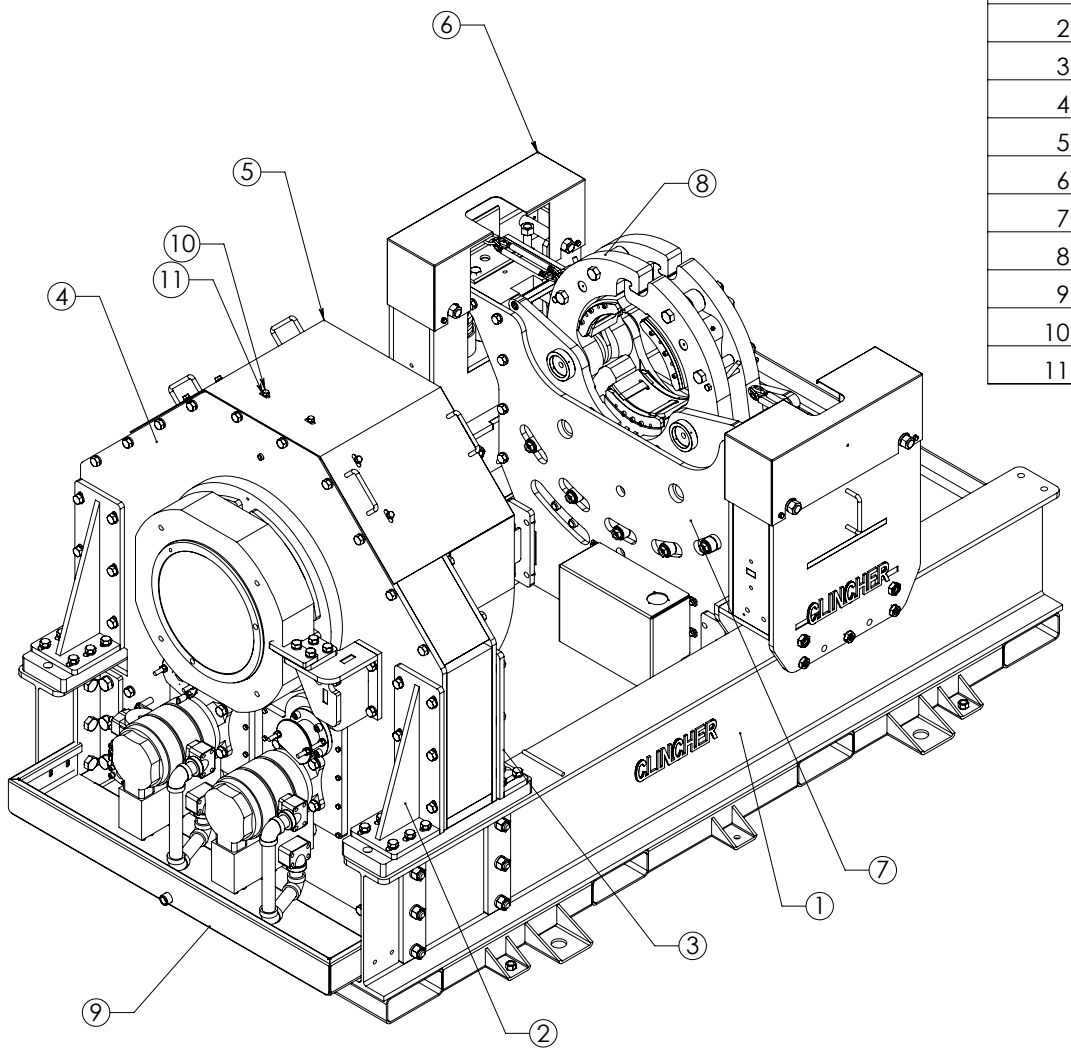
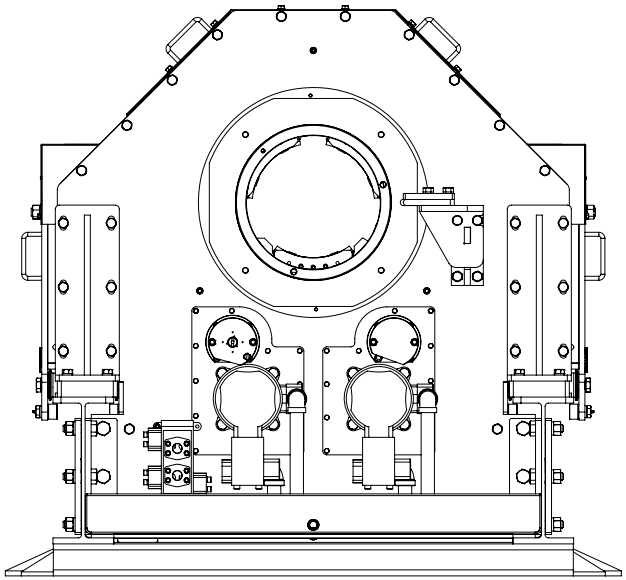


Item #	Qty.	Part Number	Part Name
1	1	CLEBU1512	BUCKING UNIT FRAME
2	2	CB22013	TONG MOUNTING BRACKET ASSEMBLY
3	2	CB22025	TONG MOUNTING BRACKET ASSEMBLY
4	1	CLEBU1532	15" 100,000 ft-lb TONG ASSEMBLY
5	1	CLEBU1521	COVER WELDMENT
6	2	CLEBU1536	CARRIAGE ASSEMBLY
7	1	CLEBU1509	15" BACKUP HOUSING ASSEMBLY
8	1	BUCS15000-01	15" DRILL PIPE BACKUP
9	1	CLEBU1513	BOLT-ON TRAY
10	6	1112	1/2"-13 x 1 1/2" HHCS
11	6	1103	1/2" LOCKWASHER



APPROX.WEIGHT (lbs.) = 13319

15" BUCKING UNIT - *TYPE 3*
OVERALL VIEW

ASSEMBLY NO. CLEBU1500-32

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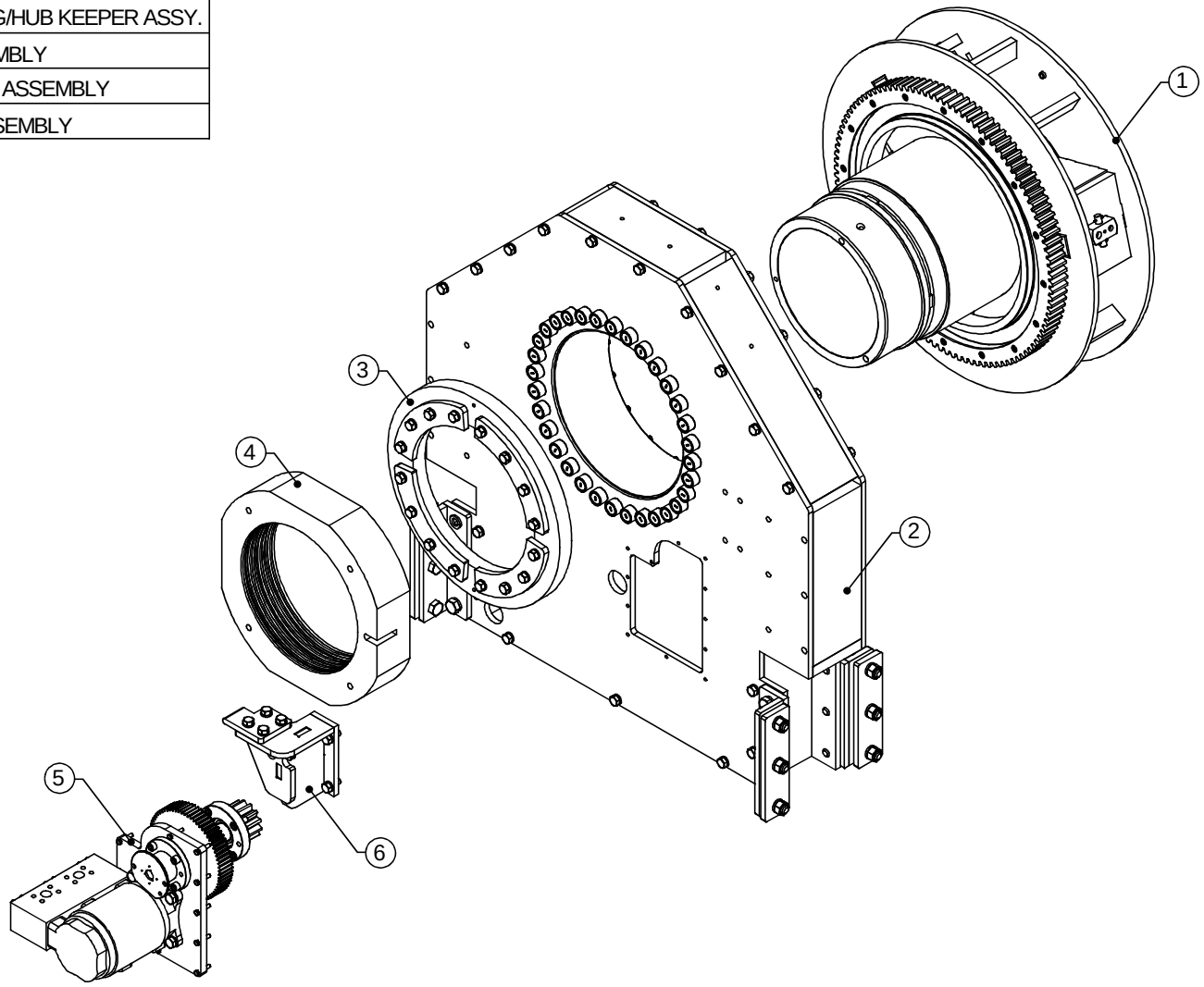
REV. #	LOG #	DATE

Item #	Qty.	Part Number	Part Name
1	1	CLEBU15-A1	TONG HUB ASSEMBLY
2	1	CLEBU15-A2	TONG BODY ASSEMBLY
3	1	CLEBU15-A3	TONG BEARING RING/HUB KEEPER ASSY.
4	1	CLEBU15-A4	TONG SWIVEL ASSEMBLY
5	1	CLEBU15-A5	TONG GEAR/MOTOR ASSEMBLY
6	1	CLEBU1519	SWIVEL KEEPER ASSEMBLY



TONG ASSEMBLY

ASSEMBLY NO. CLEBU1501

APPROX. WEIGHT (LBS.) = 5302

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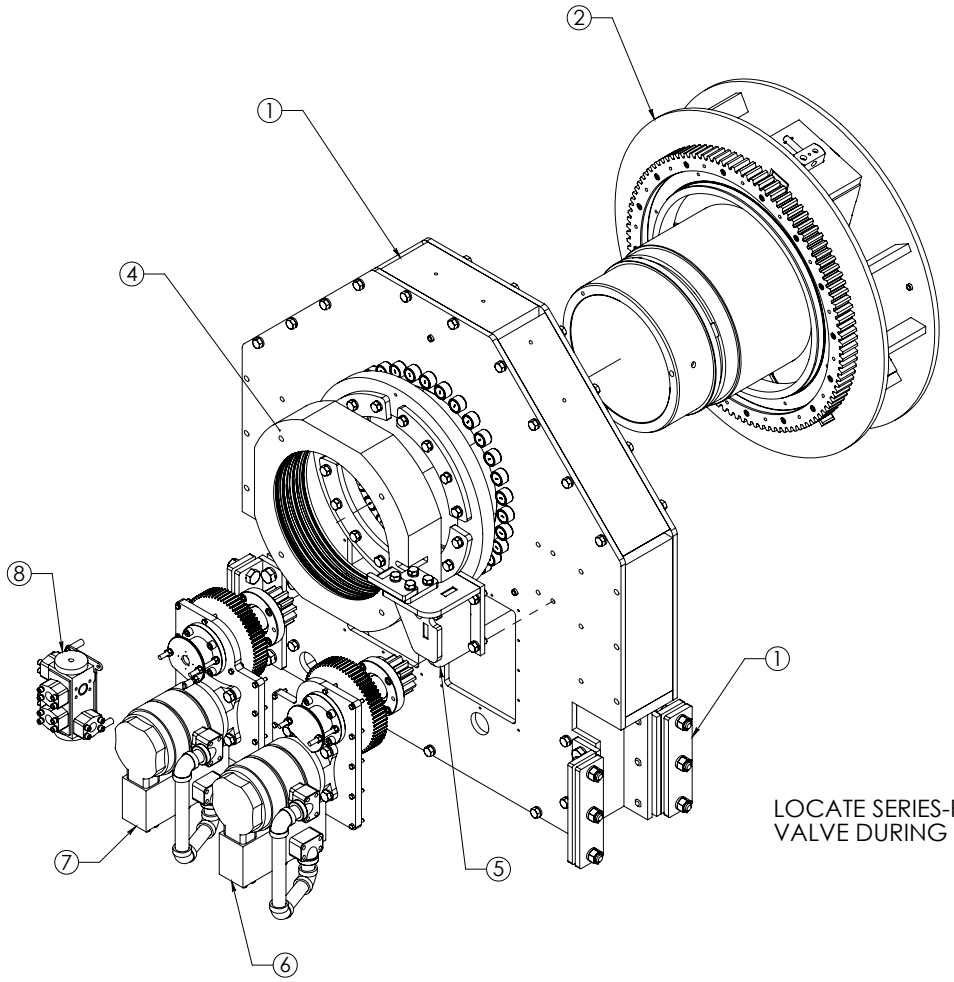
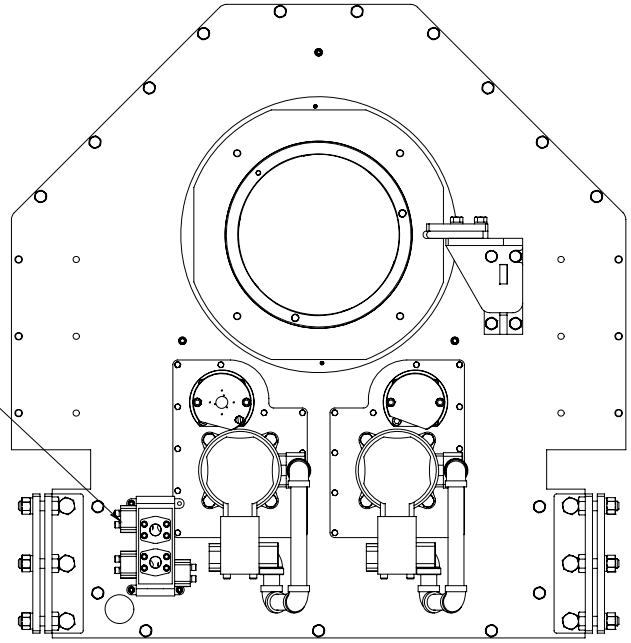
1	1	CLEBU1533	TONG BODY ASSEMBLY
2	1	CLEBU15-A1	TONG HUB ASSEMLBY
3	1	CLEBU15-A3	TONG BEARING RING/HUB KEEPER ASSEMBLY
4	1	CLEBU15-A4	TONG SWIVEL ASSEMBLY
5	1	CLEBU1519	SWIVEL KEEPER ASSEMBLY
6	1	CLEBU15-A6	MOTOR ASSEMBLY (NO ENCODER)
7	1	CLEBU15-A7	MOTOR ASSEMBLY
8	1	22238	SERIES-PARALLEL VALVE ASSEMBLY
9	1	BAC-5M25RCFF	5000 PSI GAUGE
10	3	1150-C	#6-32 X 1 1/2" BRASS BOLT
11	3	1150-A	#6-32 BRASS NUT





APPROX.WEIGHT (lbs.) = 5844

TONG ASSEMBLY

ASSEMBLY NO. CLEBU1532

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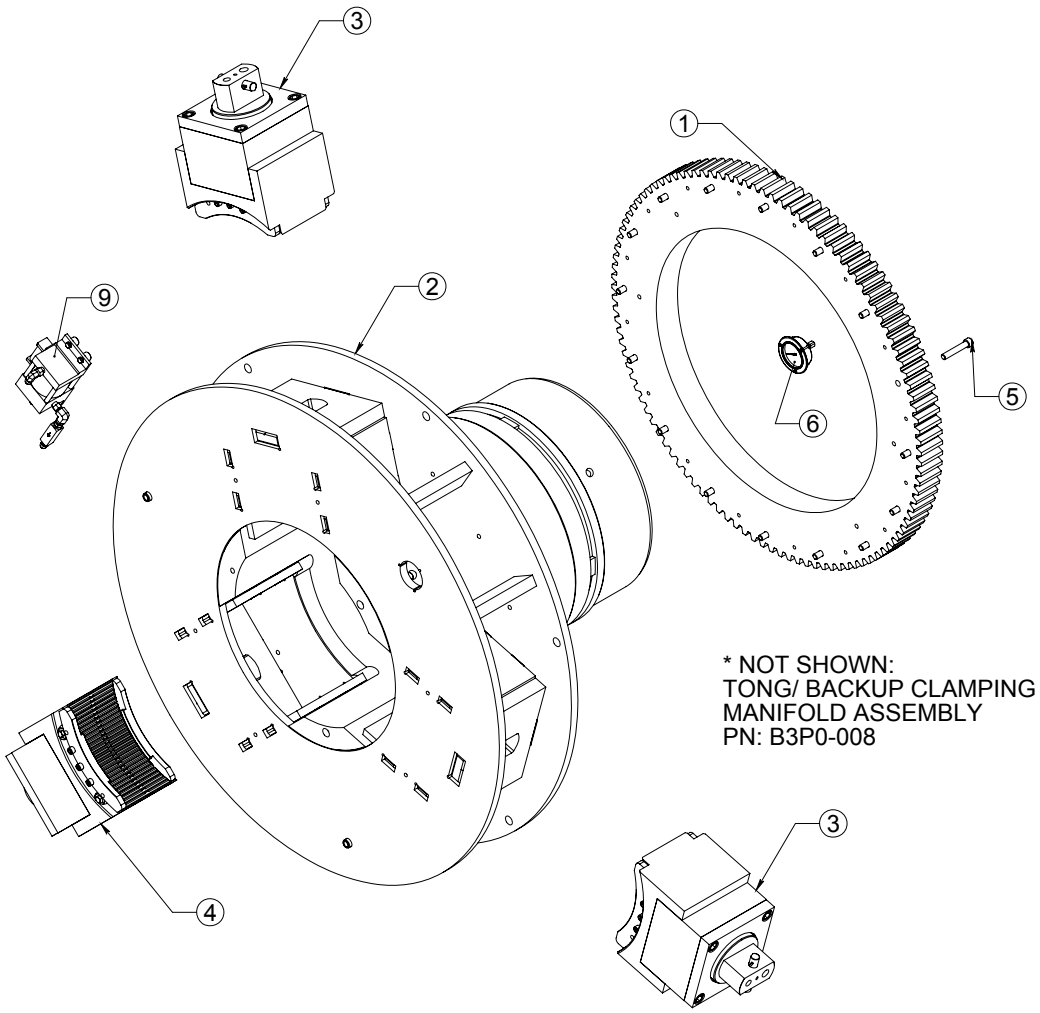
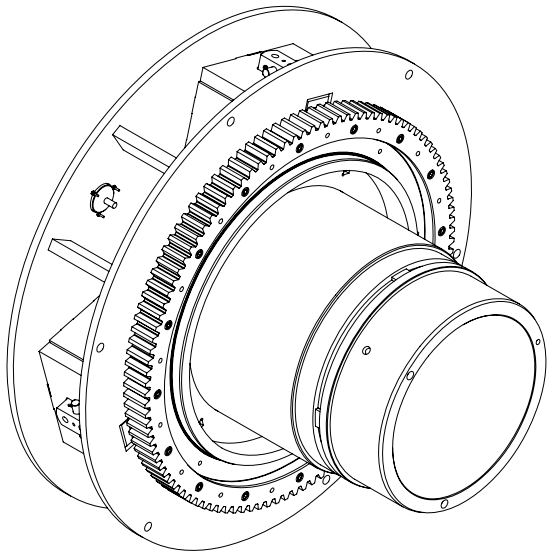
REV.#	LOG#	DATE
REF:		

Item #	Qty.	Part Number	Part Name
1	1	CB11753006	RING GEAR, 36" 108 TOOTH
2	1	CLEBU1502	HUB WELDMENT
3	2	CLEBU1514	CYLINDER ASSEMBLY
4	1	CLEBU1514-C	CYLINDER ASSEMBLY
5	16	1063	1/2-13 x 1 1/2 SHCS
6	1	BAC-5M25RCFF	5000 PSI GAUGE
7	3	1150-C	#6-32 X 1 1/2" BRASS BOLT
8	3	1150-A	#6-32 BRASS NUT
9	1	BULJ4035-A	HUB HASKEL PUMP ASSEMBLY



* NOT SHOWN:
TONG/ BACKUP CLAMPING
MANIFOLD ASSEMBLY
PN: B3P0-008



TONG HUB ASSEMBLY

ASSEMBLY NO. CLEBU15-A1

APPROX.WEIGHT (lbs.) = 1736

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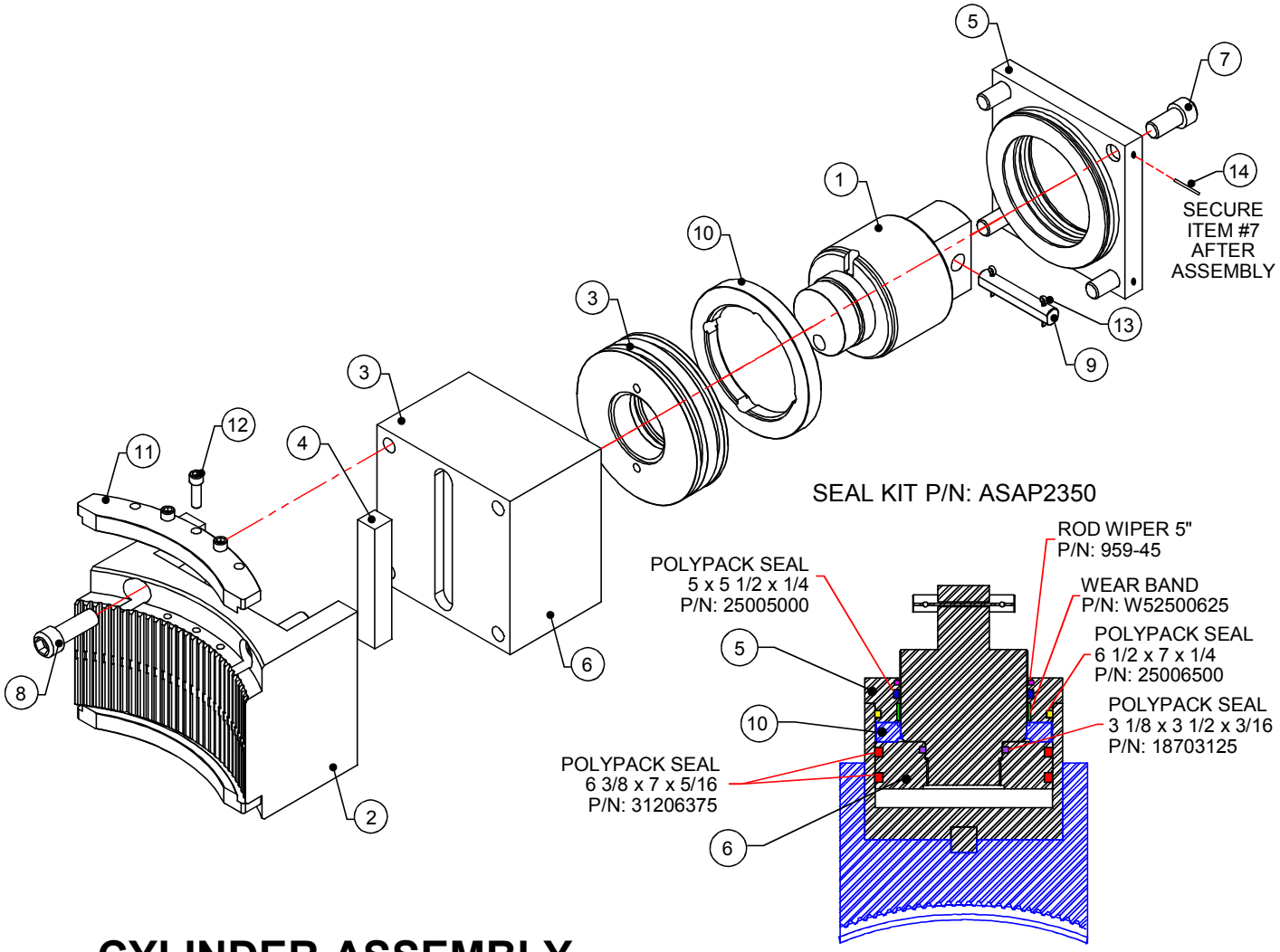
		04/13/09
REV. #	LOG #	DATE

CYLINDER ASSEMBLY NO. CLEBU1514

Item #	Qty.	Part Number	Part Name
1	1	CB2302-S1	CYLINDER ROD
2	1	CLEBU1515	CYLINDER JAW
3	1	CB2304	CYLINDER
4	1	BUCS15035	CYLINDER KEY
5	1	CLE18511	GLAND
6	1	CLE18504	PISTON
7	4	1171-B	3/4"-10 x 1 1/2" SHCS
8	4	1332	3/4"-10 x 2 SHCS
9	1	CLEBU1621	PISTON RETAINER PIN
10	- -	- - - - -	- - - - -
11	2	BUCST1508	CLIP
12	6	1042	3/8"-16 x 1 1/4" SHCS
13	2	1003	1/8" x 1" COTTER PIN
14	4	1005-A	3/16" x 1/2" ROLL PINS

CENTER CYLINDER ASSEMBLY NO. CLEBU1514-C

Item #	Qty.	Part Number	Part Name
1	1	CB2302-S1	CYLINDER ROD
2	1	CLEBU1515	CYLINDER JAW
3	1	CB2304	CYLINDER
4	1	BUCS15035	CYLINDER KEY
5	1	CLE18511	GLAND
6	1	CLE18504	PISTON
7	4	1171-B	3/4"-10 x 1 1/2" SHCS
8	4	1277	3/4"-10 x 2 1/4" SHCS
9	1	CLEBU1621	PISTON RETAINER PIN
10	1	CB2305	CENTER CYLINCER SPACER
11	2	BUCST1508	CLIP
12	6	1042	3/8"-16 x 1 1/4" SHCS
13	2	1003	1/8" x 1" COTTER PIN
14	4	1005-A	3/16" x 1/2" ROLL PINS


SECURE ITEM #7 AFTER ASSEMBLY
SEAL KIT P/N: ASAP2350
ROD WIPER 5" P/N: 959-45
POLYPACK SEAL 5 x 5 1/2 x 1/4 P/N: 25005000
WEAR BAND P/N: W52500625
POLYPACK SEAL 6 1/2 x 7 x 1/4 P/N: 25006500
POLYPACK SEAL 3 1/8 x 3 1/2 x 3/16 P/N: 18703125
POLYPACK SEAL 6 3/8 x 7 x 5/16 P/N: 31206375
SECTION A - A

CYLINDER ASSEMBLY

ASSEMBLY NO. CLEBU1514

CENTER CYLINDER ASSEMBLY

ASSEMBLY NO. CLEBU1514-C

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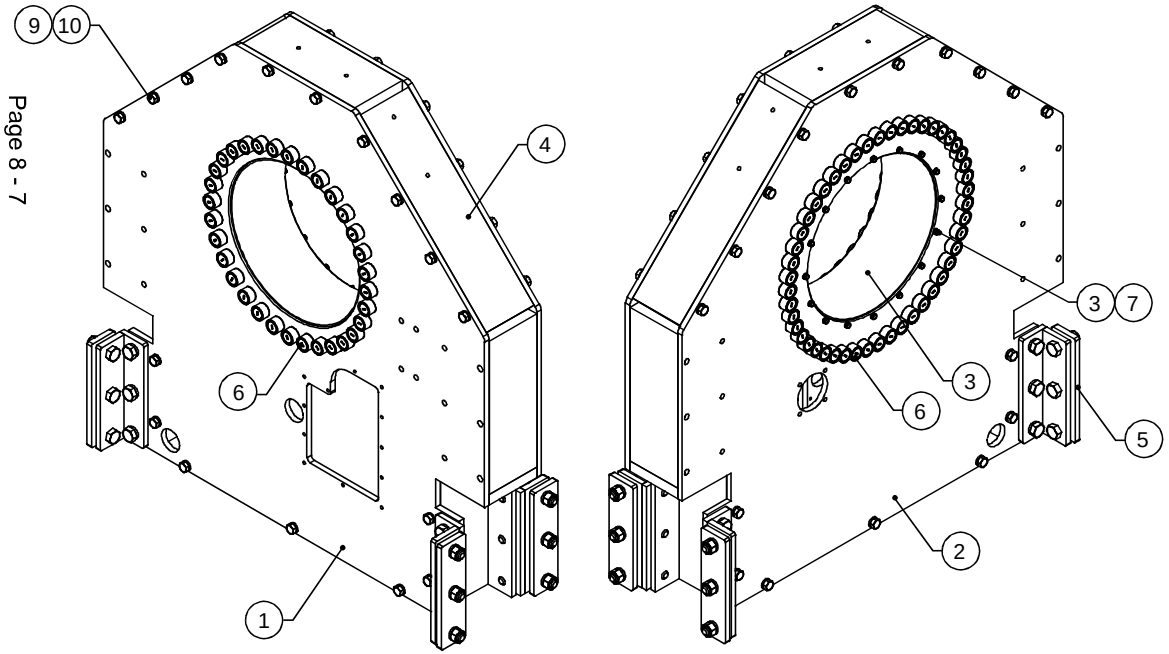
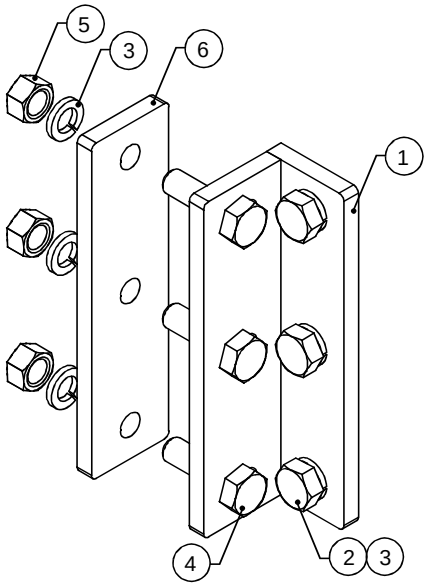
		04/16/09
REV. #	LOG #	DATE

Item #	Qty.	Part Number	Part Name
1	1	CLEBU1505	TONG BODY REAR PLATE
2	1	CLEBU1506	TONG BODY FRONT PLATE
3	1	CLEBU1516	TONG BODY CENTER SPACER
4	1	CLEBU1518	MID BODY
5	4	CB11753035	TONG MOUNTING BRACKET ASSEMBLY
6	80	SSCF1875	CAM FOLLOWER ASSEMBLY
7	16	1027	3/8" LOCKWASHER
8	16	1049	3/8"-16 x 1 1/2" HHCS
9	34	1171	3/4" LOCKWASHER
10	34	1174	3/4"-10 x 2 1/4" HHCS

TONG MOUNTING BRACKET ASSEMBLY NO. CB11753035

Item #	Qty.	Part Number	Part Name
1	1	CB1175303502	TONG MOUNTING BRACKET WELDMENT
2	3	74044	1"-8 x 2" HHCS
3	6	1218	1" LOCKWASHER
4	3	1288-B	1"-8 x 3 1/2" HHCS
5	3	1210	1"-8 NC HEX NUT
6	1	CB11090	MOUNTING BRACKET PLATE





APPROX. WEIGHT (LBS.) = 2430.485

APPROX. WEIGHT (LBS.) = 36.725

TONG BODY ASSEMBLY

ASSEMBLY NO. CLEBU15-A2

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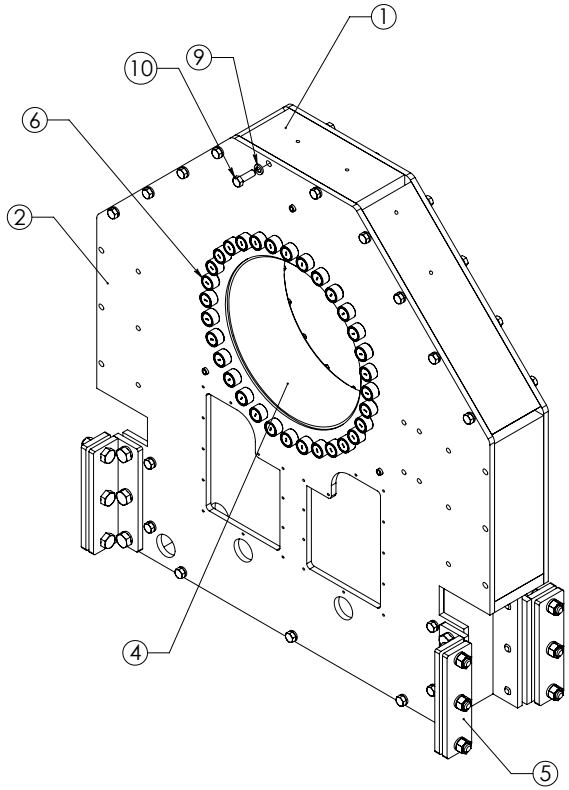
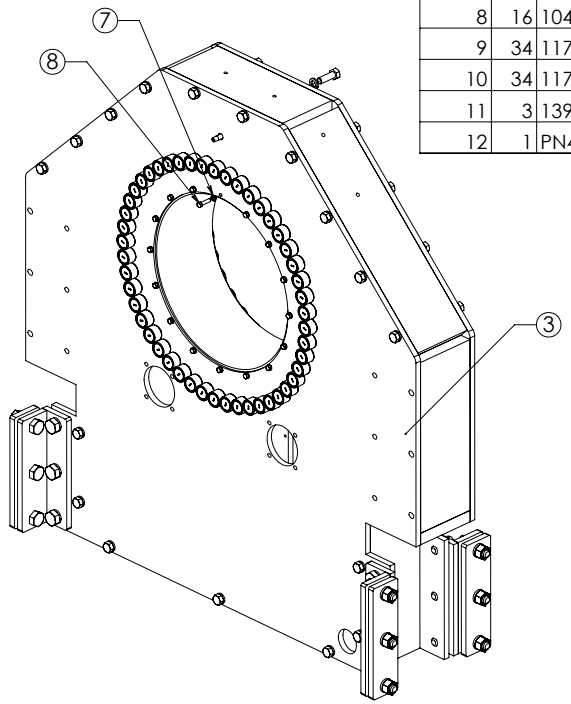
		12/28/05
REV. #	LOG #	DATE

REF: S:\Equip Manuals-Dwgs\CLEBU1501\CLEBU15-A2.wpg





Item #	Qty.	Part Number	Part Name
1	1	CLEBU1518	MIDBODY
2	1	CLEBU1534	TONG BODY REAR PLATE
3	1	CLEBU1535	TONG BODY FRONT PLATE
4	1	CLEBU1516	TONG BODY CENTER SPACER
5	4	CB11753035	TONG MOUNTING BRACKET ASSEMBLY
6	80	SSCF1875	1 7/8" SEVERE SERVICE CAM FOLLOWER
7	16	1027	WASHER, LOCK 3/8"
8	16	1049	3/8"-16 X 1 1/2" HHCS
9	34	1171	3/4" LOCKWASHER
10	34	1174	3/4"-10 X 2 1/4" HHCS
11	3	1398	1/4" COLLAR
12	1	PN4-10	1/4" NPT PIPE NIPPLE (10" LONG)

APPROX.WEIGHT (lbs.) = 2394

TONG BODY ASSEMBLY

ASSEMBLY NO. CLEBU1533

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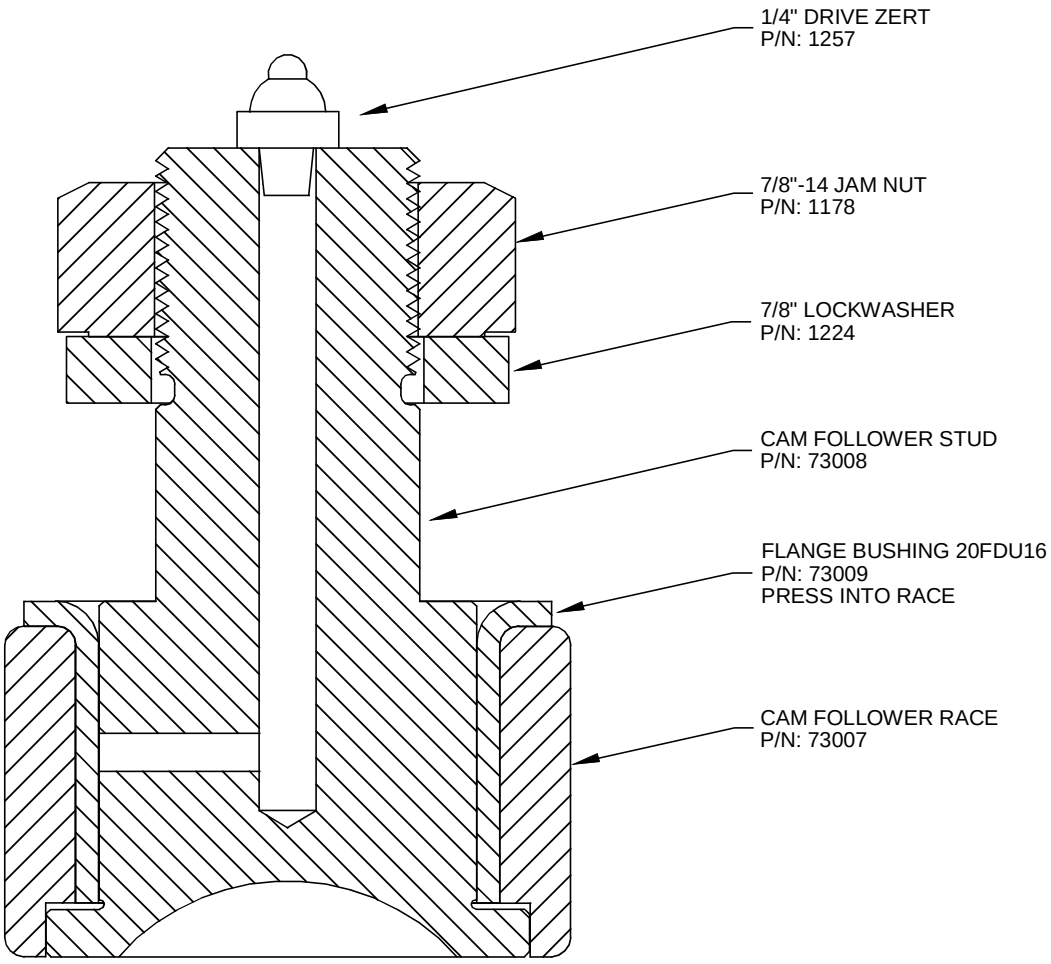
REV. #	LOG #	DATE



SECTION VIEW

1 7/8" SEVERE SERVICE CAM FOLLOWER ASSEMBLY

ASSEMBLY NO. SSCF1875

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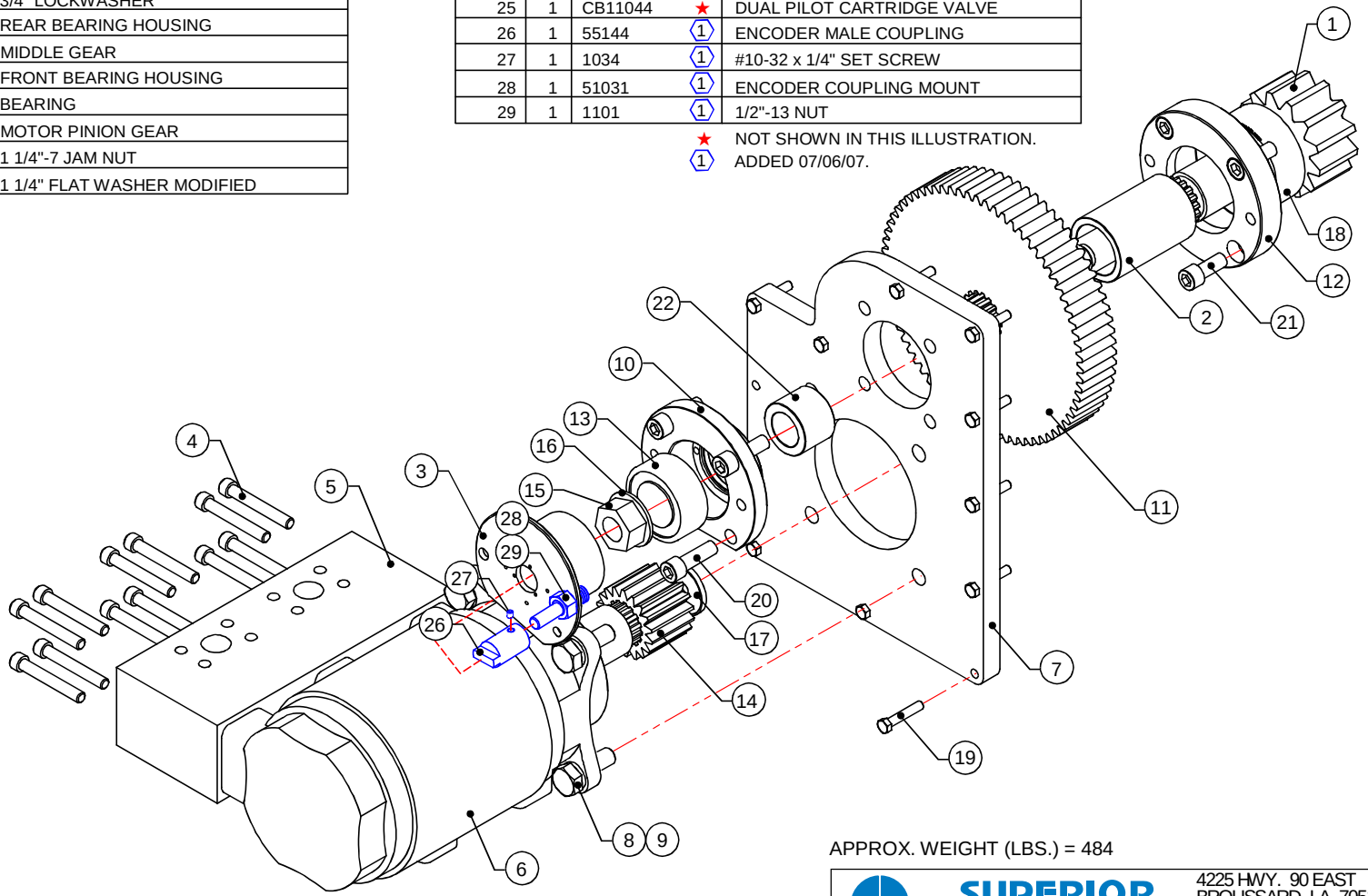
REV. #	LOG #	DATE
1		10/08/04

REF: S:\Equip Manuals-Dwgs\CLE8625DP\SSCF1875 rev1.wpg

Item #	Qty.	Part Number	Part Name
1	1	CB2215	PINION SHAFT
2	1	CB2218	BEARING SPACER
3	1	CB11100	ENCODER ASSY. PROTECTOR WELDM.
4	12	1286	1/2"-13 x 7" SHCS
5	1	CB11043	TWO SPEED MANIFOLD
6	1	CB11048	RINEER HYDRAULIC MOTOR
7	1	CLEBU1517	GEAR HOUSING COVER PLATE
8	4	1174	3/4"-10 x 2 1/4" HHCS
9	4	1171	3/4" LOCKWASHER
10	1	CB11753015	REAR BEARING HOUSING
11	1	CB2216	MIDDLE GEAR
12	1	CB11753014	FRONT BEARING HOUSING
13	1	1902	BEARING
14	1	CB11753021	MOTOR PINION GEAR
15	1	1268	1 1/4"-7 JAM NUT
16	1	1319-B	1 1/4" FLAT WASHER MODIFIED

Item #	Qty.	Part Number	Part Name
17	1	CB1175302101	2 1/4" x 1/8" FLAT WASHER
18	1	1905	BEARING
19	12	1050	3/8"-16 x 2" HHCS
20	4	1155	5/8"-11 x 2" SHCS
21	4	257	5/8"-11 x 1 1/2" SHCS
22	1	CB2219	BEARING SPACER
23	2	30028 ★	90° SOCKET WELD FLANGE
24	3	30029 ★	1 1/4" 90° SOCKET WELD ELBOW
25	1	CB11044 ★	DUAL PILOT CARTRIDGE VALVE
26	1	55144 ⬡1	ENCODER MALE COUPLING
27	1	1034 ⬡1	#10-32 x 1/4" SET SCREW
28	1	51031 ⬡1	ENCODER COUPLING MOUNT
29	1	1101 ⬡1	1/2"-13 NUT

★ NOT SHOWN IN THIS ILLUSTRATION.
⬡1 ADDED 07/06/07.



TONG DRIVE ASSEMBLY

ASSEMBLY NO. CLEBU15-A5

APPROX. WEIGHT (LBS.) = 484

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REV. #	LOG #	DATE
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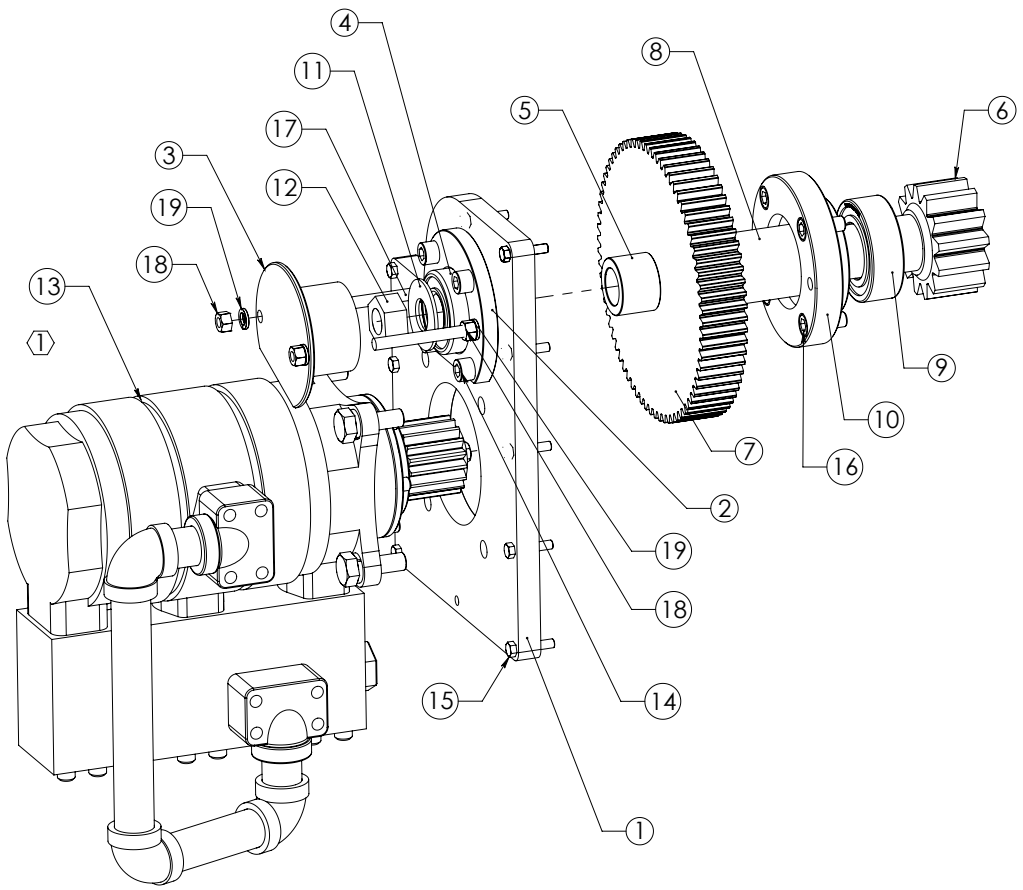
REF: P:\Manuals\Equip Manuals\Dwgs\CLEBU1501\CLEBU15-A5 rev1.wpg



Item #	Qty.	Part Number	Part Name
1	1	CLEBU1517	GEAR HOUSING COVER PLATE
2	1	CB11753015	REAR BEARING HOUSING
3	1	CB1538	BEARING COVER WELDMENT
4	1	1902	BEARING P/N MRC5308MZZ
5	1	CB2219	BEARING SPACER
6	1	CB2215	PINION SHAFT
7	1	CB2216	MIDDLE GEAR
8	1	CB2218	BEARING SPACER
9	1	1905	BEARING
10	1	CB11753014	FRONT BEARING HOUSING
11	1	1319	1 1/4" FLAT WASHER
12	1	1225	1 1/4-7 HEX NUT
13	1	CB1539	MOTOR ASSEMBLY
14	4	1155	5/8-11 x 2 SHCS
15	12	141	3/8"-16 X 1 3/4" HHCS
16	4	256	5/8"-11 X 1 1/4" SHCS
17	2	CLEBU9654	1/2"-13 X 5 1/2" ALL THREAD
18	4	1101	NUT, HEX, 1/2-13
19	4	1103	1/2" LOCKWASHER

APPROX.WEIGHT (lbs.) = 506

TONG DRIVE ASSEMBLY (NO ENCODER)

ASSEMBLY NO. CLEBU15-A6

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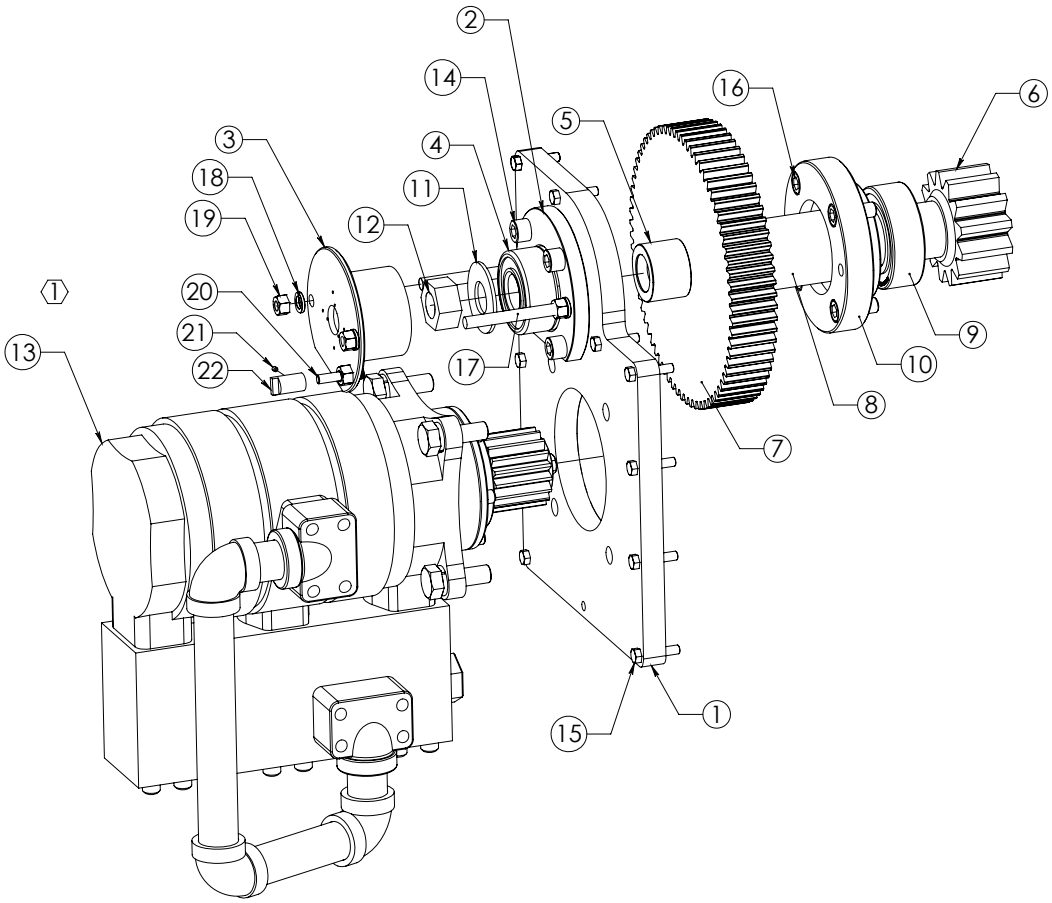
REV. #	LOG #	DATE
1		



Item #	Qty.	Part Number	Part Name
1	1	CLEBU1517	GEAR HOUSING COVER PLATE
2	1	CB11753015	REAR BEARING HOUSING
3	1	CB11100	ENCODER ASSEMBLY PROTECTOR WELDMENT
4	1	1902	BEARING P/N MRC5308MZZ
5	1	CB2219	BEARING SPACER
6	1	CB2215	PINION SHAFT
7	1	CB2216	MIDDLE GEAR
8	1	CB2218	BEARING SPACER
9	1	1905	BEARING
10	1	CB11753014	FRONT BEARING HOUSING
11	1	1319	1 1/4" FLAT WASHER
12	1	1225	1 1/4-7 HEX NUT
13	1	CB1539	MOTOR ASSEMBLY
14	4	1155	5/8-11 x 2 SHCS
15	12	141	3/8"-16 X 1 3/4" HHCS
16	4	256	5/8"-11 X 1 1/4" SHCS
17	2	CLEBU9654	1/2"-13 X 5 1/2" ALL THREAD
18	4	1103	1/2" LOCKWASHER
19	5	1101	NUT, HEX, 1/2-13
20	1	51031	ENCODER COUPLING MOUNT
21	1	1034	#10-32 X 1/4" SET SCREW
22	1	55144	ENCODER COUPLING

APPROX.WEIGHT (lbs.) = 506

TONG DRIVE ASSEMBLY

ASSEMBLY NO. CLEBU15-A7

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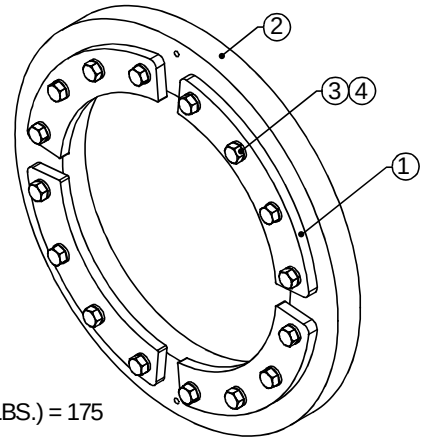
REV. #	LOG #	DATE
1		

Item #	Qty.	Part Number	Part Name
1	4	CLEBU1508	HUB KEEPER
2	1	CLEBU1507	BEARING RING
3	16	1183	3/4"-10 x 2 1/2" HHCS
4	16	1171	3/4" LOCKWASHER

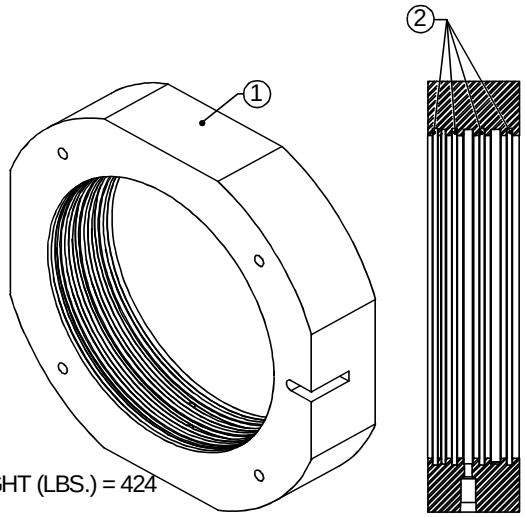


APPROX. WEIGHT (LBS.) = 175

TONG BEARING RING / HUB KEEPER ASSEMBLY

ASSEMBLY NO. CLEBU15-A3

Item #	Qty.	Part Number	Part Name
1	1	CLEBU1709	HYDRAULIC SWIVEL
2	4	CLEBU1660	ROT GLYD RING

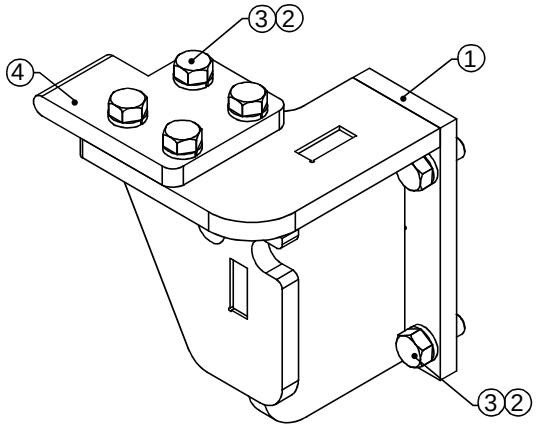


APPROX. WEIGHT (LBS.) = 424

TONG SWIVEL ASSEMBLY

ASSEMBLY NO. CLEBU15-A4

Item #	Qty.	Part Number	Part Name
1	1	CLEBU1520	SWIVEL KEEPER WELDMENT
2	8	1171	3/4" LOCKWASHER
3	8	1173	3/4"-10 x 1 3/4" HHCS
4	1	CLEBU1730-S1	SWIVEL KEEPER PLATE



APPROX. WEIGHT (LBS.) = 49

SWIVEL KEEPER ASSEMBLY

ASSEMBLY NO. CLEBU1519

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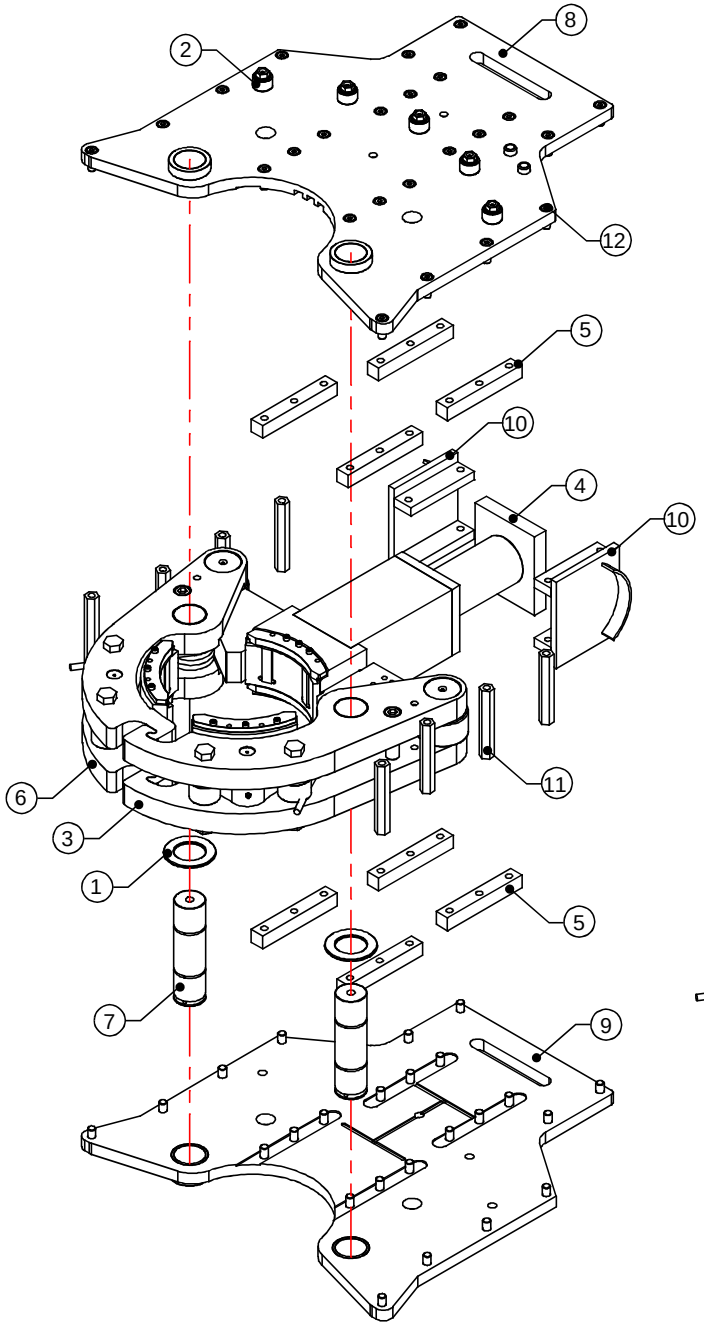
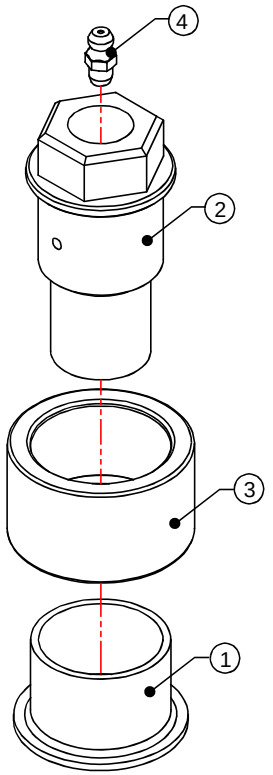
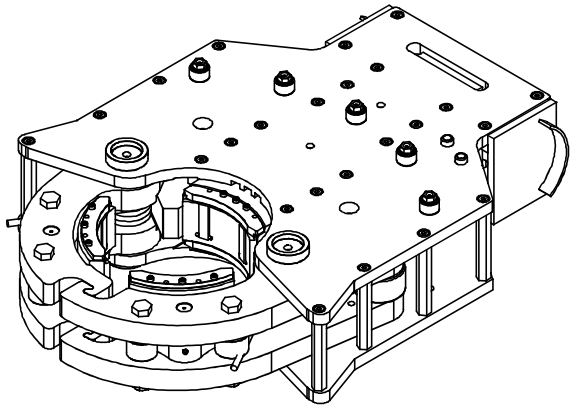
		01/03/06
REV. #	LOG #	DATE

REF: P:\Manuals\Equip Manuals\Dwgs\CLEBU1501\CLEBU15-A3 &A4 CLEBU1519.wpg



Item #	Qty.	Part Number	Part Name
1	2	BUCDP9618	DOOR PIVOT BUSHING
2	10	BUCS11825-01	CAM FOLLOWER ASSEMBLY
3	1	BUCS15005	OUTSIDE DOOR ASSEMBLY
4	1	BUCS15006-01	CYLINDER ASSEMBLY
5	8	BUCS15012	CYLINDER GUIDE
6	1	BUCS15015	INSIDE DOOR ASSEMBLY
7	2	BUCS15021	BACKUP PIVOT PIN
8	1	BUCS15101	TOP PLATE WELDMENT
9	1	BUCS15102	BOTTOM PLATE WELDMENT
10	2	BUCS23103	LOADCELL BRACKET WELDMENT
11	9	BUCS23104	SPACER
12	48	1171-B	1/2"-13 x 1 1/2" SHCS





CAM FOLLOWER ASSEMBLY NO. BUCS11825-01

Item #	Qty.	Part Number	Part Name
1	1	73009	FLANGE BUSHING
2	1	BUCS11825	CAM FOLLOWER STUD
3	1	73007	CAM FOLLOWER RACE
4	1	1257	1/4" DRIVE ZERT

BACKUP ASSEMBLY

ASSEMBLY NO. BUCS15000-01

APPROX. WEIGHT (LBS.) = 1920.553

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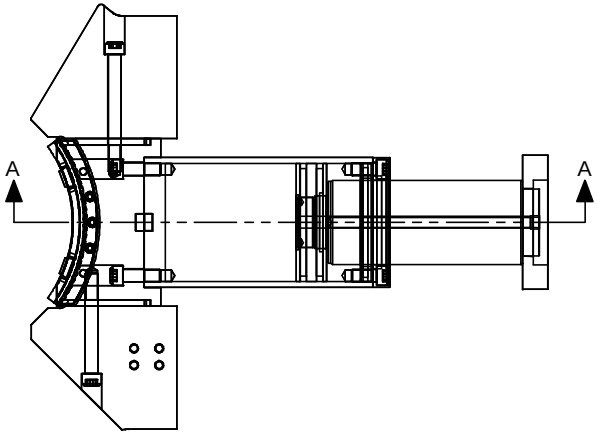
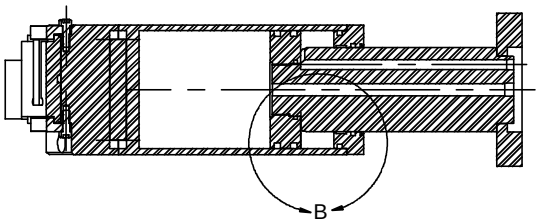
		01/03/06
REV. #	LOG #	DATE

REF: P:\Manuals\Equip Manuals\Dwgs\BUCS15000-01\Backup.wpg

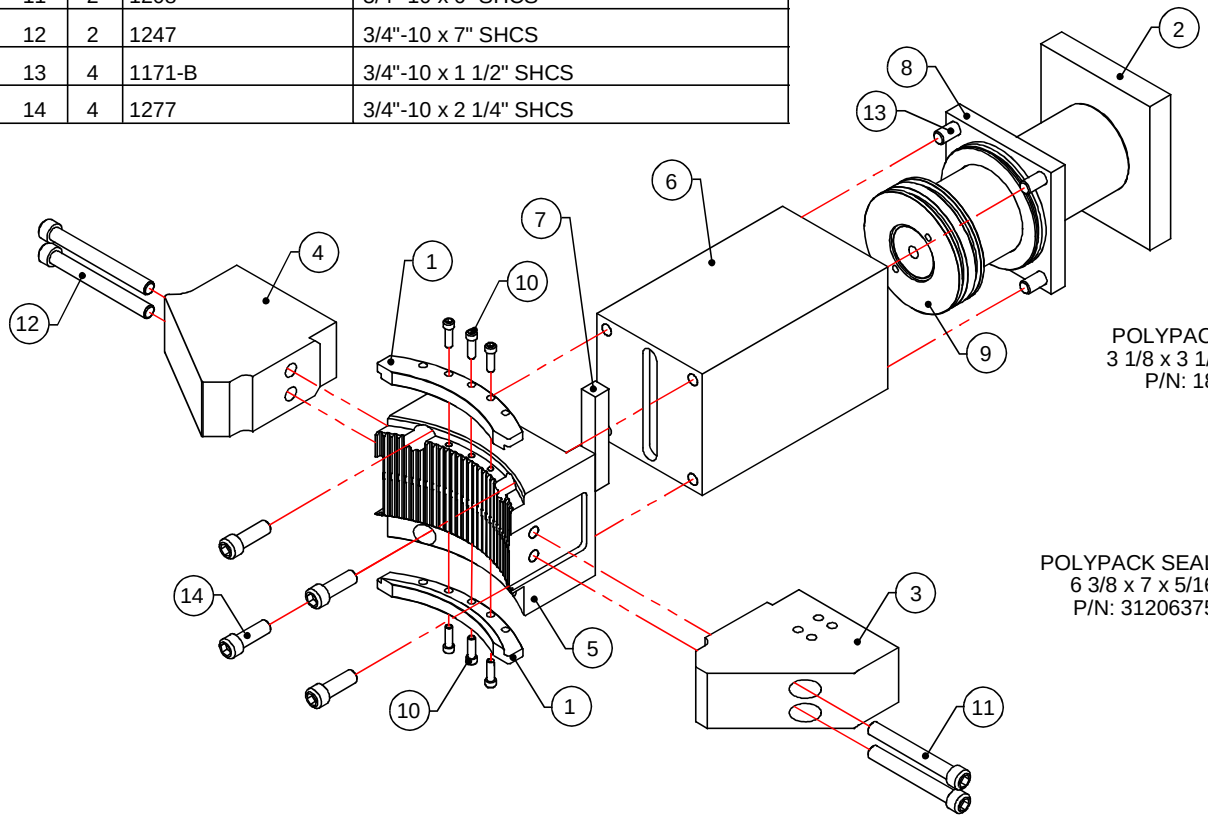
Item #	Qty.	Part Number	Part Name
1	2	BUCST1508	CLIP
2	1	BUCS15008	ROD WELDMENT
3	1	BUCS15017	OUTSIDE DOOR WEDGE
4	1	BUCS15019	INSIDE DOOR WEDGE
5	1	BUCS15033	CYLINDER JAW
6	1	BUCS15034	CYLINDER
7	1	BUCS15035	CYLINDER KEY
8	1	CLE18511	GLAND
9	1	CLE18504	PISTON
10	6	1042	3/8"-16 x 1 1/4" SHCS
11	2	1208	3/4"-10 x 6" SHCS
12	2	1247	3/4"-10 x 7" SHCS
13	4	1171-B	3/4"-10 x 1 1/2" SHCS
14	4	1277	3/4"-10 x 2 1/4" SHCS

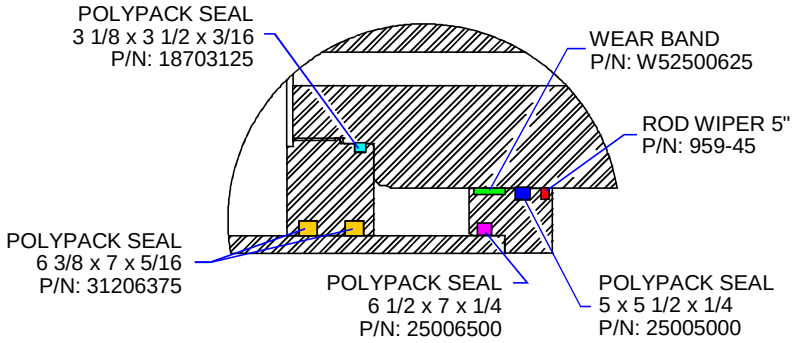
STROKE = 9.800"





SECTION A - A





DETAIL B

SEAL KIT P/N: ASAP2350

APPROX. WEIGHT (LBS.) = 396.532

CYLINDER ASSEMBLY

ASSEMBLY NO. BUCS15006-01

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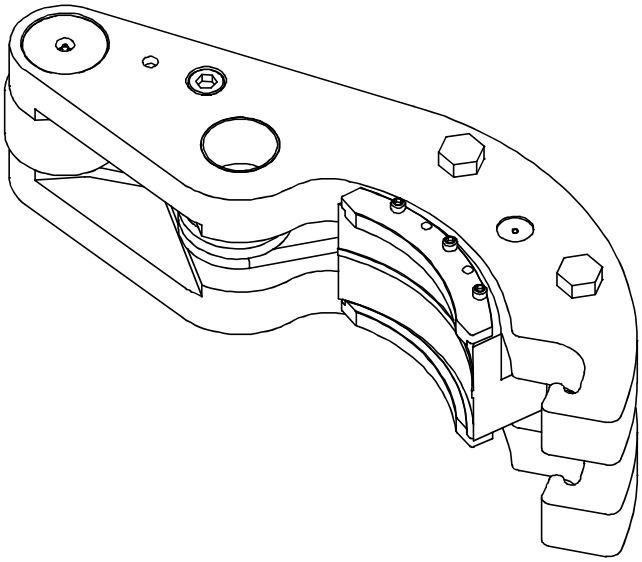
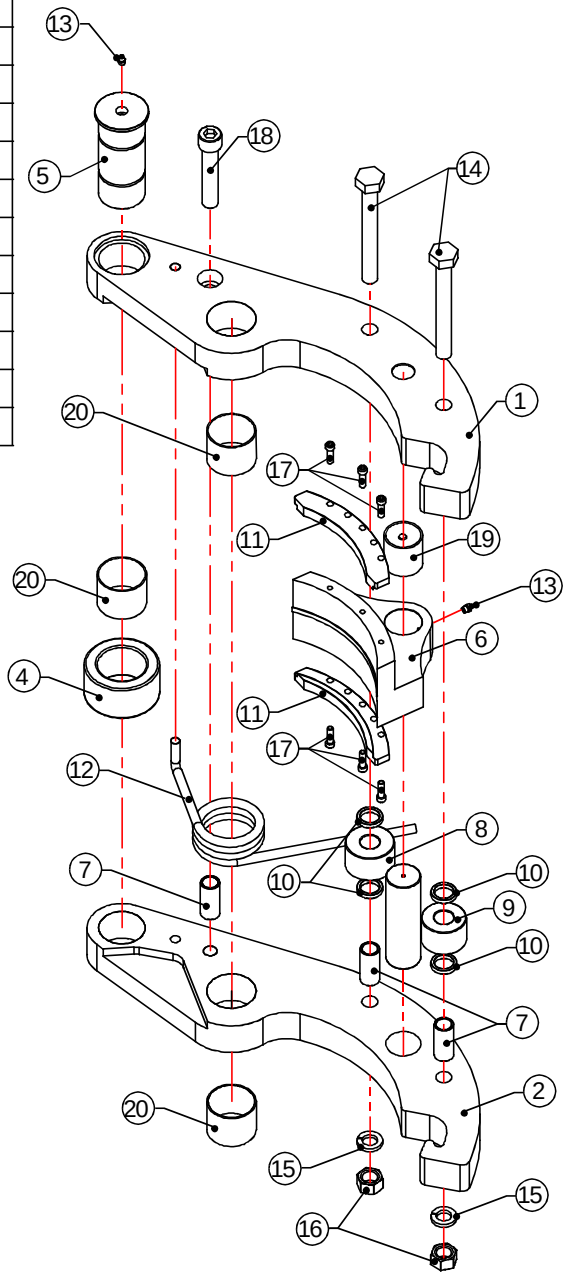
		01/05/06
REV. #	LOG #	DATE

REF: P:\Manuals\Equip Manuals\Dwgs\BUCS15000-01\15006-01 Cyl.wpg

Item #	Qty.	Part Number	Part Name
1	1	BUCDP15003	TOP OUTSIDE DOOR PLATE
2	1	BUCDP15007	BOTTOM OUTSIDE DOOR PLATE
3	1	BUCS15009	INSERT PIVOT PIN
4	1	BUCS15010	DOOR ROLLER
5	1	BUCS15011	DOOR ROLLER PIN
6	1	BUCS15020	DOOR INSERT
7	3	BUCS15037	DOOR SPACER
8	1	BUCS15075	REAR PIVOTING INSERT SPRING
9	1	BUCS15076	FRONT PIVOTING INSERT SPRING
10	4	BUCS15054	INSERT SPRING SPACER
11	2	BUCST1508	CLIP
12	1	SMH1501-L	TORSION SPRING
13	2	1001	1/8" NPT ZERT
14	2	1315	1"-8 x 8 1/2" HHCS
15	2	1218	1" LOCKWASHER
16	2	1210	1"-8 HEX NUT
17	6	1042	3/8"-16 x 1 1/4" SHCS
18	1	1342	1"-8 x 5 1/4" SHCS
19	1	36DU40-02	MODIFIED GARLOCK BUSHING
20	3	48DU40	GARLOCK BUSHING





APPROX. WEIGHT (LBS.) = 216.677

OUTSIDE DOOR ASSEMBLY

ASSEMBLY NO. BUCS15005

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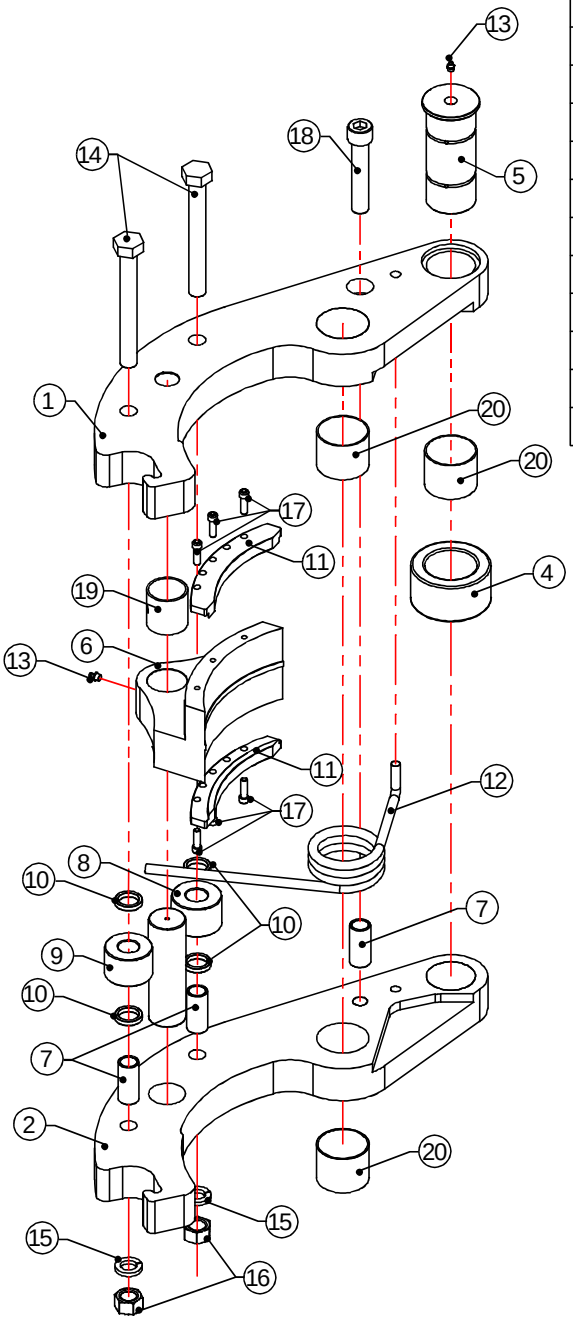
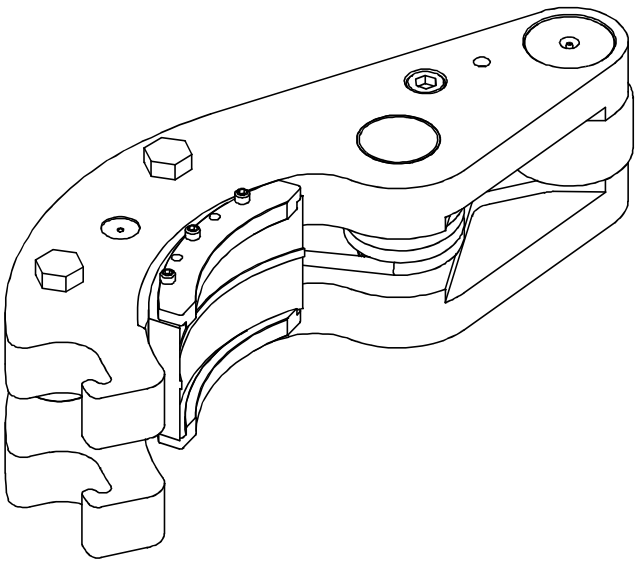
REV. #	LOG #	DATE
1		01/04/06

REF: P:\Manuals\Equip Manuals\Dwgs\BUCS15000\BUCS15005 Door O rev1.wpg

Item #	Qty.	Part Number	Part Name
1	1	BUCDP15013	TOP INSIDE DOOR PLATE
2	1	BUCDP15012	BOTTOM INSIDE DOOR PLATE
3	1	BUCS15009	INSERT PIVOT PIN
4	1	BUCS15010	DOOR ROLLER
5	1	BUCS15011	DOOR ROLLER PIN
6	1	BUCS15020	DOOR INSERT
7	3	BUCS15037	DOOR SPACER
8	1	BUCS15075	REAR PIVOTING INSERT SPRING
9	1	BUCS15076	FRONT PIVOTING INSERT SPRING
10	4	BUCS15054	INSERT SPRING SPACER
11	2	BUCST1508	CLIP
12	1	SMH1501-L	TORSION SPRING
13	2	1001	1/8" NPT ZERT
14	2	1315	1"-8 x 8 1/2" HHCS
15	2	1218	1" LOCKWASHER
16	2	1210	1"-8 HEX NUT
17	6	1042	3/8"-16 x 1 1/4" SHCS
18	1	1342	1"-8 x 5 1/4" SHCS
19	1	36DU40-02	MODIFIED GARLOCK BUSHING
20	3	48DU40	GARLOCK BUSHING





APPROX. WEIGHT (LBS.) = 308.948

INSIDE DOOR ASSEMBLY

ASSEMBLY NO. BUCS15015

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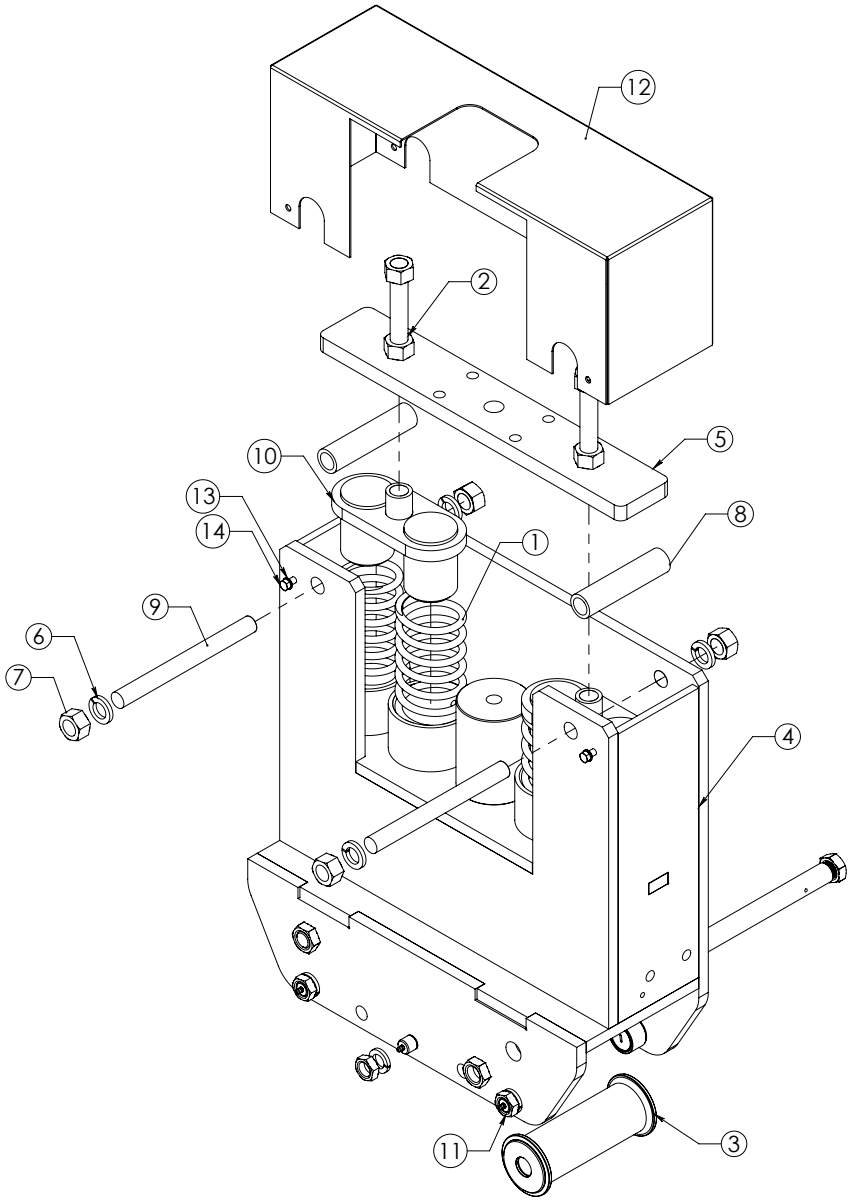
REV. #	LOG #	DATE
1		01/04/06

REF: P:\Manuals\Equip Manuals\Dwgs\BUCS15000\BUCS15015 Door I rev1.wpg



Item #	Qty.	Part Number	Part Name
1	4	CB1536	COMPRESSION SPRING
2	2	BUCS11823	ADJUSTMENT ROD WELDMENT
3	2	CB11753031	ROLLER ASSEMBLY
4	1	CB22003	CARRIAGE WELDMENT
5	1	CB22005	SPRING RETAINER PLATE WELDMENT
6	4	1218	1" LW
7	4	1210	1"-8 NUT GR. 8
8	2	CB22006	STOP TUBE
9	2	CB22007	CARRIAGE ALL-THREAD ROD
10	2	CB22008	TOP SPRING RETAINER
11	6	SSCF1875	1 7/8" SEVERE SERVICE CAM FOLLOWER
12	1	CB22003-S9	CARRIAGE COVER
13	4	1027	WASHER, LOCK 3/8"
14	4	1047	3/8"-16 X 1" HHCS

CARRIAGE ASSEMBLY

ASSEMBLY NO. CLEBU1536

APPROX.WEIGHT (lbs.) = 565

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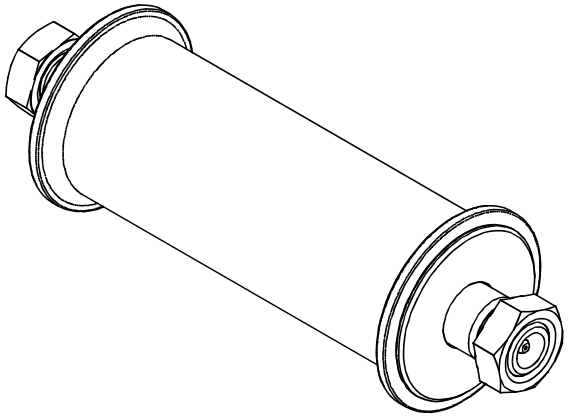
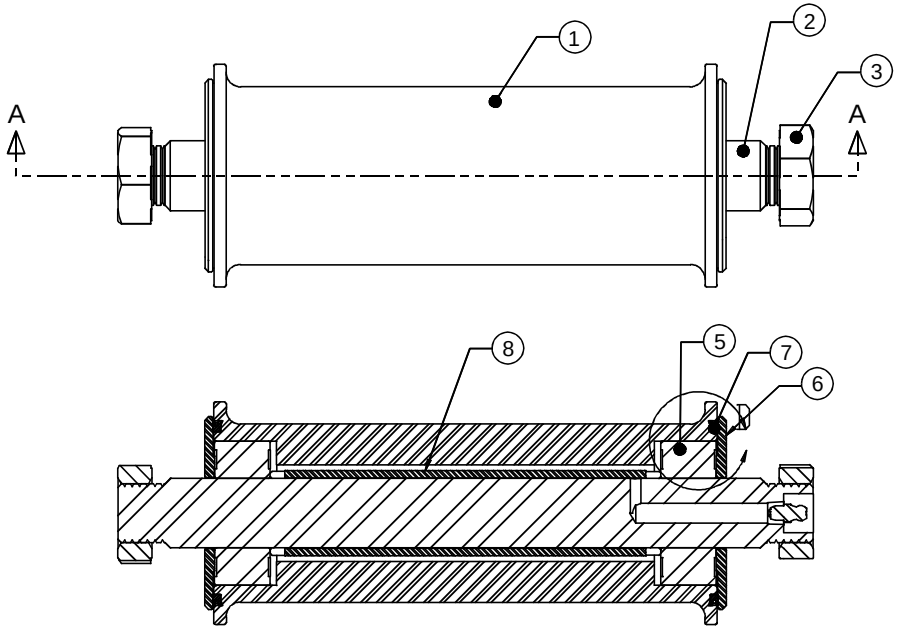
		12/02/05
REV. #	LOG #	DAT/.1E

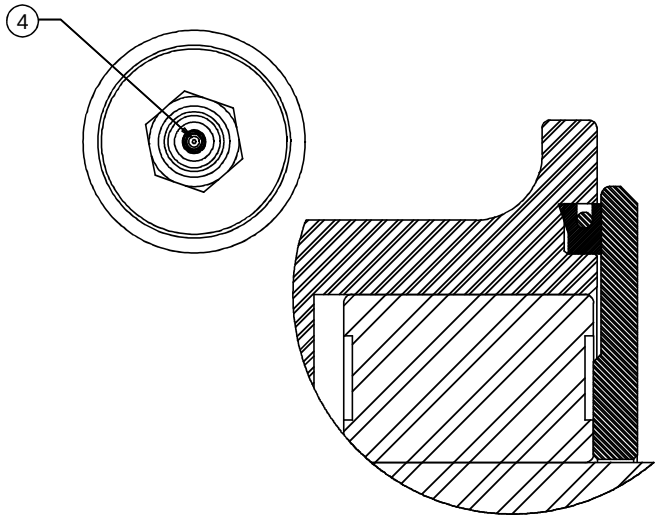
REF: S:\Equip Manuals-Dwgs\CLEBU2300-30\Carriage.wpg



Item	Qty.	Part Number	Description
1	1	CB1175303101	3" x 8 1/2" ROLLER
2	1	CB1175303102	ROLLER SHAFT FOR 8 1/2" ROLLER
3	2	1213	1"-12 NYLOCK JAM NUT
4	1	1001	1/8" NPT ZERT
5	2	1984	CYLINDRICAL ROLLER BEARING
6	2	2095	DUMBELL ROLLER SPACER
7	2	14070	SEAL ASSEMBLY
	1	14070-S1	DUMBELL ROLLER SEAL
	1	2-041	O-RING
8	1	CB1175303104	ROLLER SPACER



SECTION A-A



DETAIL D
SCALE 1.5 : 1

APPROX. WEIGHT (LBS.) = 17.54

ROLLER ASSEMBLY

ASSEMBLY NUMBER CB11753031

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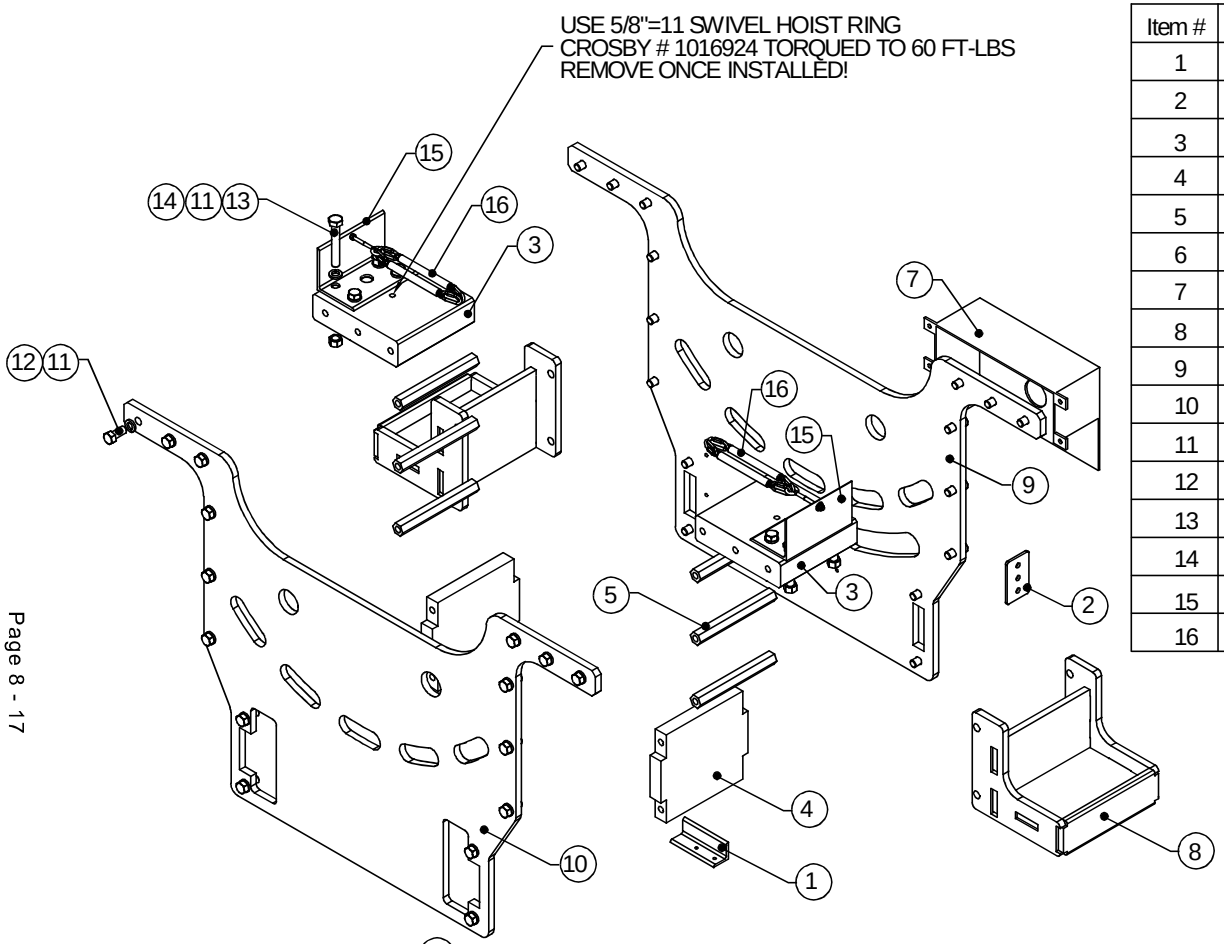
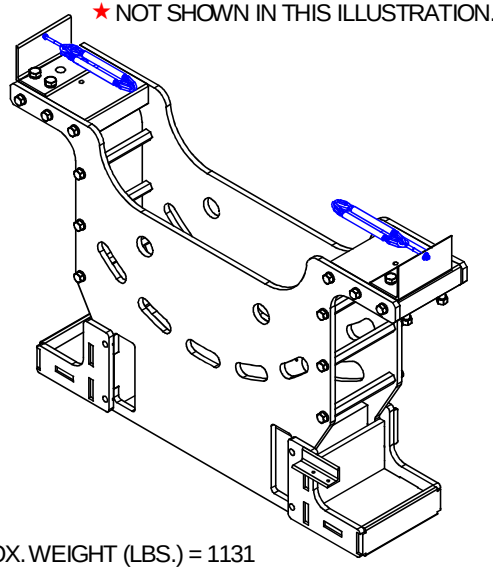
		03/25/03
REV. #	LOG #	DATE

REF: S:\Equip Manuals-Dwgs\CLEBU1175-31\Roller Assy.wpg

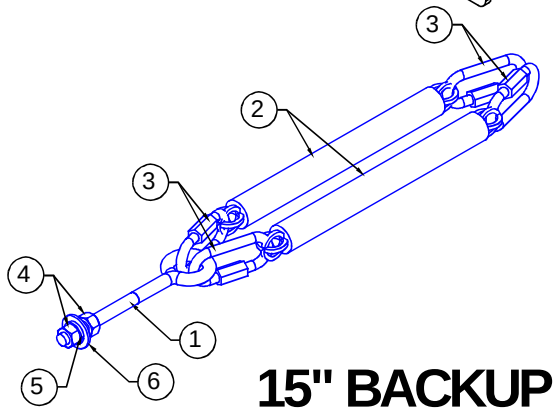


Item #	Qty.	Part Number	Part Name
1	1	BUCS23110	E-CHAIN MOUNT BRACKET
2	1	BUCS23111	BULKHEAD PLATE
3	2	BUCS23203	SPACER
4	2	BUCS23204	LOAD CELL BRACE
5	6	BUCS23205	HOUSING SPACER
6	1	CB22010-S1 ★	DUMMY LOAD CELL
7	1	CB22029	INTENSIFIER PROTECTOR
8	2	CB2307	LOAD BRACKET WELDMENT
9	1	CLEBU1510	BACKUP HOUSING REAR PLATE
10	1	CLEBU1511	BACKUP HOUSING FRONT PLATE
11	40	1171	3/4" LOCKWASHER
12	32	1173	3/4"-10 x 1 3/4" HHCS
13	8	1169	3/4"-10 x 5" HHCS
14	8	283	3/4"-10 HEX NUT
15	2	BUCS23302-01	SPRING MOUNT
16	2	BUCS23303	SPRING ASSEMBLY

★ NOT SHOWN IN THIS ILLUSTRATION.



APPROX. WEIGHT (LBS.) = 1131



SPRING ASSEMBLY NO. BUCS23303

Item #	Qty.	Part Number	Part Name
1	1	1757	5/16" x 5" EYEBOLT ZINC PLATED
2	2	BUCS23304	EXTENSION SPRING
3	4	1756	5/16" QUICK LINK ZINC PLATED
4	2	1755	5/16"-18 HEX NUT SS
5	1	1734	5/16" LOCKWASHER SS
6	1	1735	5/16" FLAT WASHER SS

15" BACKUP HOUSING ASSEMBLY

ASSEMBLY NO. CLEBU1509

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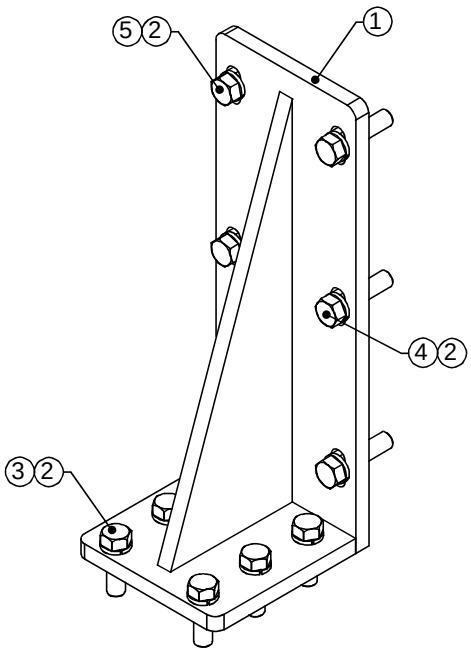
REV. #	LOG #	DATE
		01/05/06

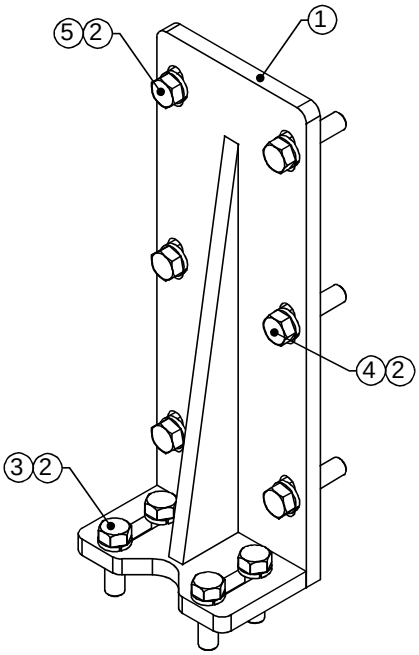
REF: P:\Manuals\Equip Manuals\Dwgs\CLEBU1500-30\CLEBU1509.wpg



Item #	Qty.	Part Number	Part Name
1	1	CB22012	TONG MOUNTING BRACKET
2	12	1171	3/4" LOCKWASHER
3	6	1183	3/4"-10 x 2 1/2" HHCS
4	3	1176	3/4"-10 x 3" HHCS
5	3	1201	3/4"-10 x 1 1/2" HHCS

ASSEMBLY NO. CB22013

APPROX. WEIGHT (LBS.) = 67



Item #	Qty.	Part Number	Part Name
1	1	CB22026	TONG MOUNTING BRACKET
2	10	1171	3/4" LOCKWASHER
3	4	1183	3/4"-10 x 2 1/2" HHCS
4	3	1176	3/4"-10 x 3" HHCS
5	3	1201	3/4"-10 x 1 1/2" HHCS

ASSEMBLY NO. CB22025

APPROX. WEIGHT (LBS.) = 50

TONG MOUNTING BRACKET ASSEMBLY

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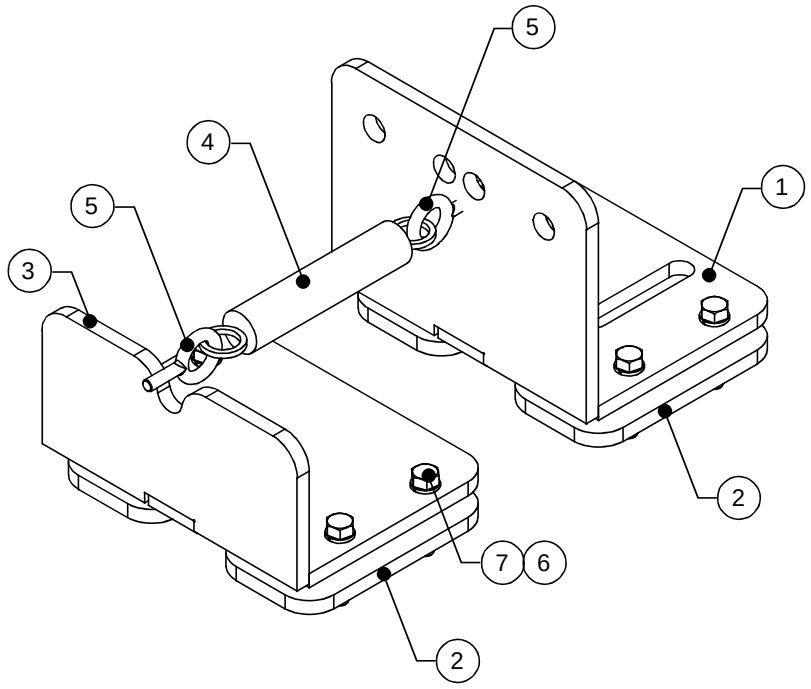
		12/06/05
REV. #	LOG #	DATE

REF: S:\Equip Manuals-Dwgs\CLEBU2300-30\Mnt Brackets.wpg

Item #	Qty.	Part Number	Part Name
1	1	CB2309	CARRIAGE SPRING RETRACTION/SHIPPING BRACKET WELDM.
2	4	CB2310	BRACE
3	1	CB2311	CARRIAGE STOP
4	1	BUCM4004-S7	EXT. SPRING #5067, 1 3/8 OD x .177 W x 7.75 L
5	2	1232	EYE BOLT 3/8"-16 x 1 1/4"
6	8	1103	1/2" LOCKWASHER
7	8	1113	1/2"-13 x 2 1/2" HHCS



CARRIAGE SPRING RETRACTION / STOP ASSEMBLY

ASSEMBLY NO. CB2312

APPROX. WEIGHT (LBS.) = 60

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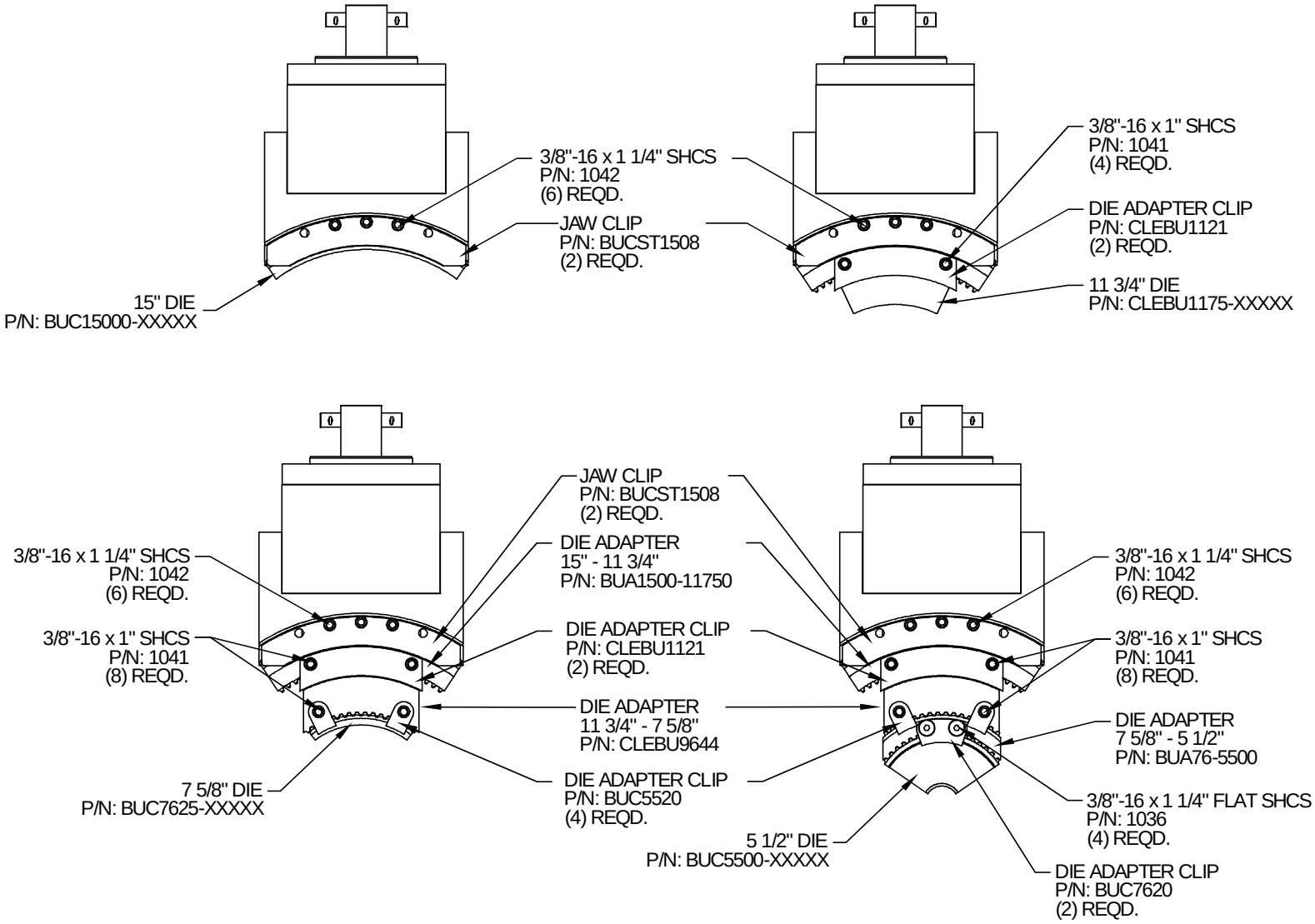
		12/06/05
REV. #	LOG #	DATE

REF: S:\Equip Manuals-Dwgs\CLEBU2300-30\CB2312.wpg



DIE ADAPTER VARIATION

FOR CYLINDER ASSEMBLY CLEBU1514

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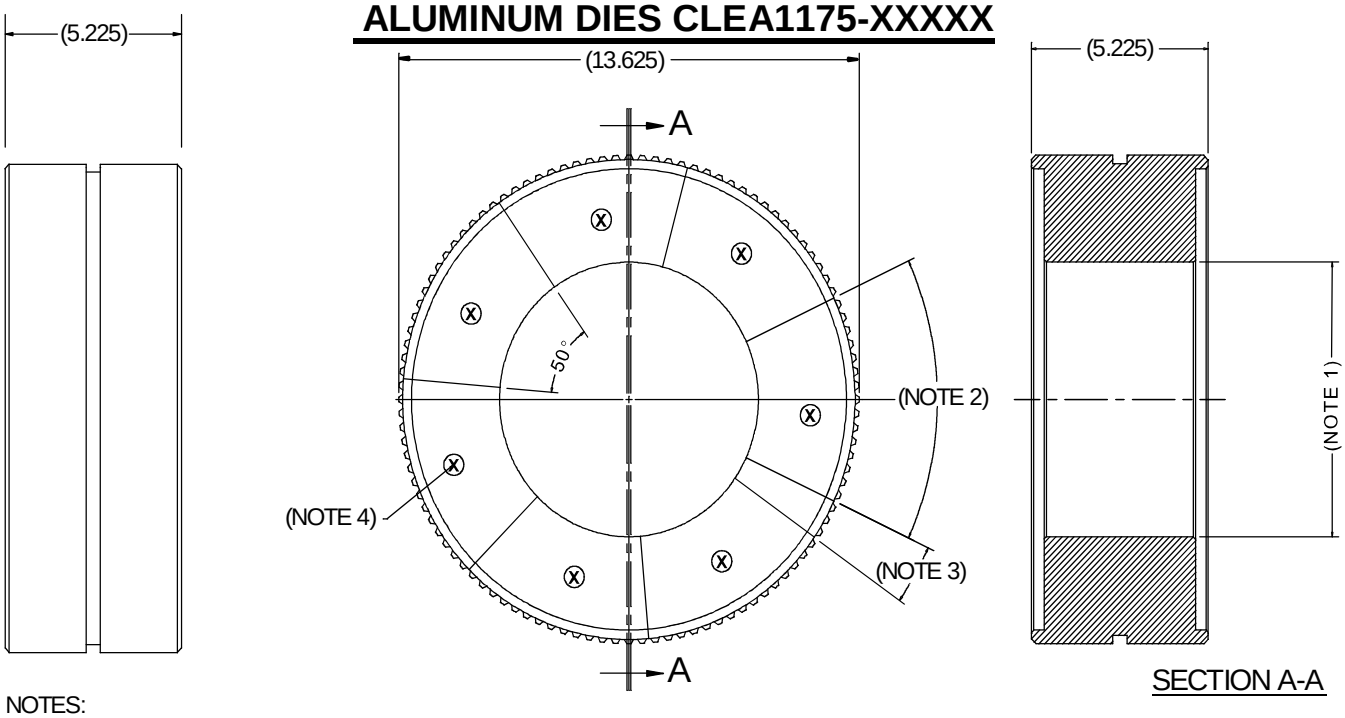
		01/05/06
REV. #	LOG #	DATE

REF: P:\Manuals\Equip Manuals\Dwgs\CLEBU1500-30\CLEBU1514 Die A.wpg

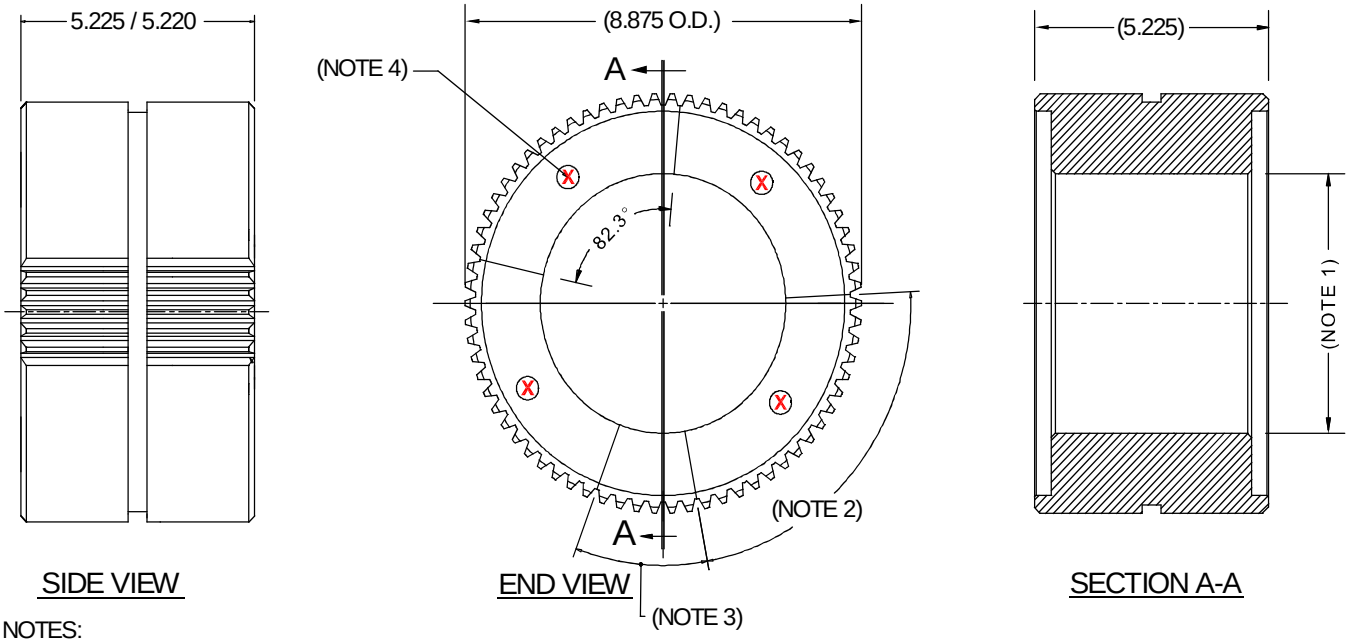
ALUMINUM DIES CLEA1175-XXXXX



NOTES:
1. BORE TO DESIRED I.D.
   NOMINAL PIPE DIA. + .035 MIN. / .040 MAX.
2. SAW CUT 7 X 15 TOOTH SECTIONS TOOTH ON CENTER.
3. SAW CUT 1 X 3 TEETH TOOTH ON CENTER (SCRAP).
4. STAMP PART NUMBER AND PATENT NO'S 4576067 & 5911796.
   EXPLANATION OF PART NUMBER: BUCL5500 = BASE #, -XXXXX =
   THREE PLACE DECIMAL DIE SIZE EQUIVALENT (DECIMAL OMITTED),
   e.g. -05500 = 5 1/2".

ALUMINUM DIES BUCA7625-XXXXX

(SIZES 2 3/8 - 7 3/4)



NOTES:
1. BORE TO DESIRED I.D.
   NOMINAL PIPE DIA. + .035 MIN. / .040 MAX.
2. SAW CUT 4 X 16 TOOTH SECTIONS ROOT ON CENTER.
3. SAW CUT 1 X 6 TOOTH SECTION (SCRAP).
4. STAMP PART NUMBER AND PATENT NO'S 4576067 & 5911796.
   EXPLANTATION OF PART NUMBER: BUCL5500 = BASE #, -XXXXX =
   THREE PLACE DECIMAL DIE SIZE EQUIVALENT (DECIMAL OMITTED),
   e.g. -5500 = 5 1/2".
5. TOOTH MILL NOT REQUIRED FOR BUCKING UNITS.

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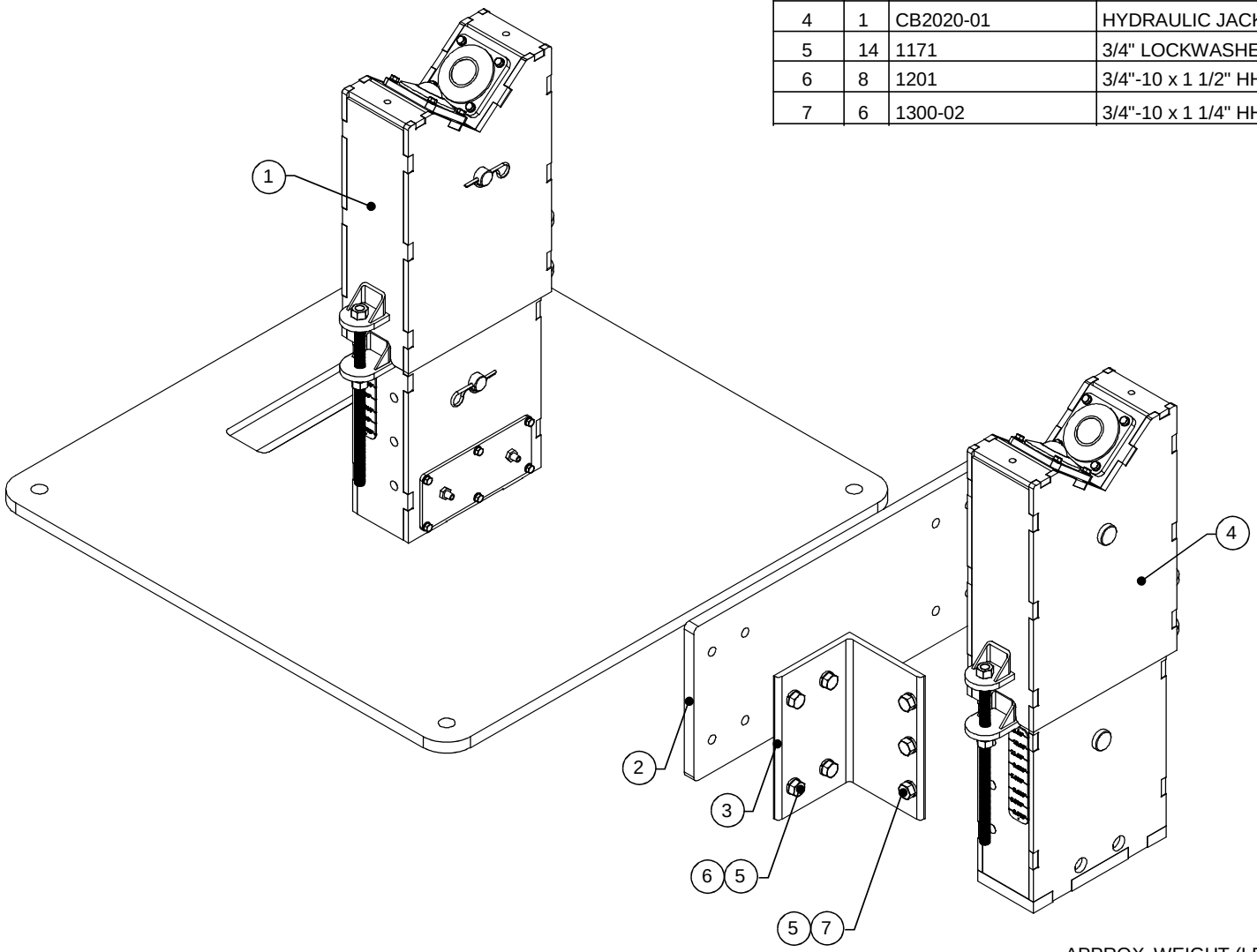
REV. #	LOG #	DATE
		07/21/05

REF: S:\Equip Manuals-Dwgs\CLEBU1175-3\Alum Die.wpg

Item #	Qty.	Part Number	Part Name
1	1	CB2010-01	HYDRAULIC JACK/ROLLER SYSTEM STAND-ALONE
2	1	CB2012-01	BRACKET MOUNTING PLATE
3	2	CB2013-01	ANGLE BRACKET
4	1	CB2020-01	HYDRAULIC JACK/ROLLER SYSTEM BOLT-ON
5	14	1171	3/4" LOCKWASHER
6	8	1201	3/4"-10 x 1 1/2" HHCS
7	6	1300-02	3/4"-10 x 1 1/4" HHCS 12 POINT FLG.



APPROX. WEIGHT (LBS) = 1635

HYDRAULIC JACK/ROLLER SYSTEM ASSEMBLY

ASSEMBLY NO. CB2000-01

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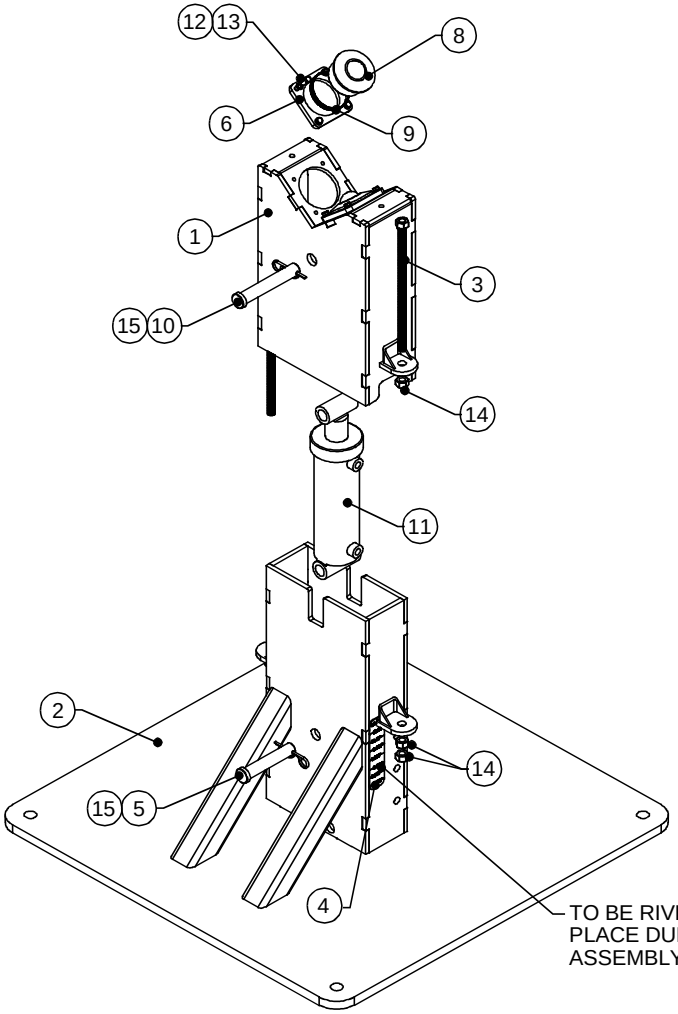
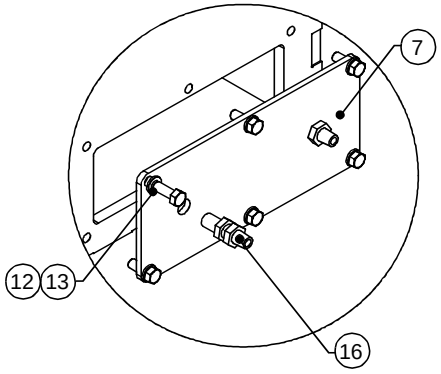
		01/10/06
REV. #	LOG #	DATE

REF: P:\Manuals\Equip Manuals\Dwgs\CB2000-01\CB2000-01 Assy.wpg

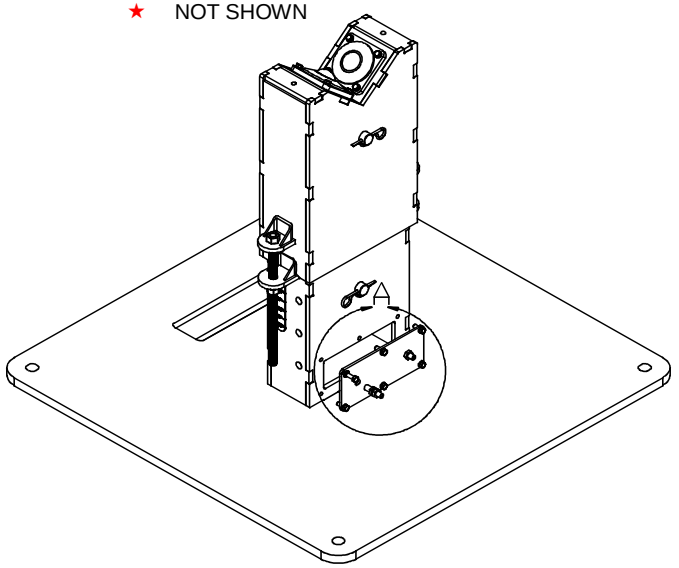
Item #	Qty.	Part Number	Part Name
1	1	CB2001-01	HYDRAULIC JACK UPPER SECTION
2	1	CB2002-01	HYDRAULIC JACK LOWER SECTION STAND-ALONE
3	2	CB2003	ALL THREAD WELDMENT
4	2	CB2004-01	SCALE FOR HYDRAULIC JACK
5	1	CB2005	CLEVIS PIN 1 1/4" x 6 1/2"
6	2	CB2006	ROLLER MOUNTING PLATE
7	1	CB2007	BULKHEAD PLATE
8	2	CB2008	HEAVY DUTY BALL TRANSFER UNIT
9	2	CB2011	FIXING CLIP FOR BALL TRANSFER UNIT
10	1	CB2014	CLEVIS PIN 1 1/4" x 7 5/8"
11	1	CB2023	CYLINDER 4" BORE 8" STROKE 2 1/4" ROD
12	14	1027	3/8" LOCKWASHER
13	14	1047	3/8"-16 x 1" HHCS
14	6	272	3/4"-16 JAM NUT
15	2	6009	HAIRPIN COTTER PIN 0.243 F/ 1 1/8" - 1 1/2" ROUND
16	2	6 WFTX	MALE BULKHEAD CONNECTOR 37° FLARE/NPTF
17	1	BUC5524 ★	P.O. CHECK VALVE

★ NOT SHOWN





DETAIL A
SCALE 1 : 6



APPROX. WEIGHT (LBS) = 1073

HYDRAULIC JACK/ROLLER SYSTEM

STAND-ALONE ASSEMBLY

ASSEMBLY NO. CB2010-01

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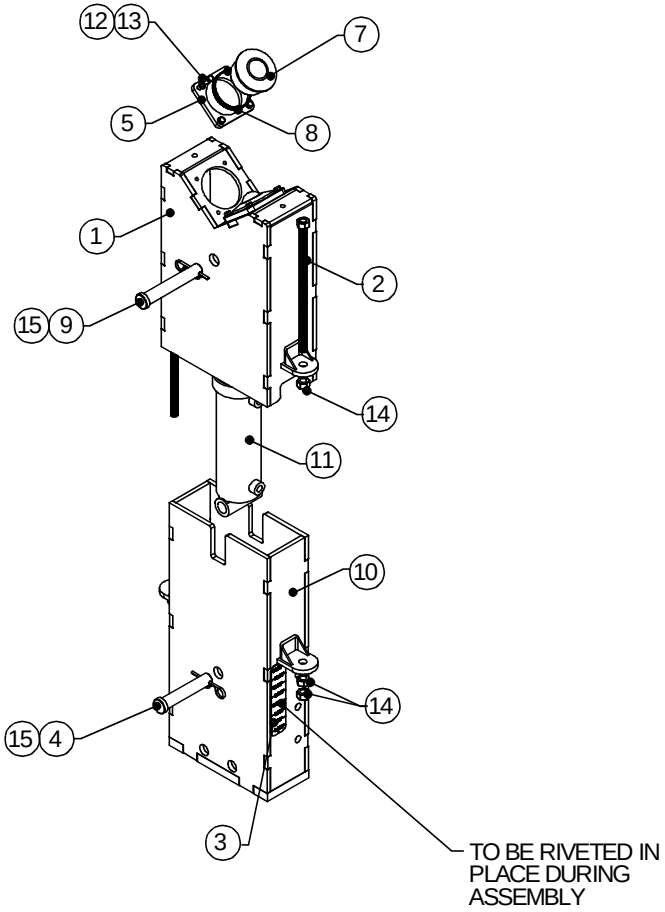
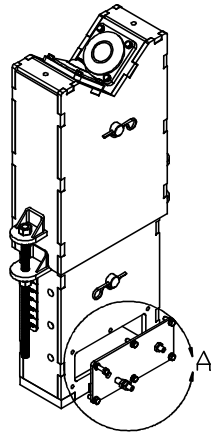
		01/10/06
REV. #	LOG #	DATE

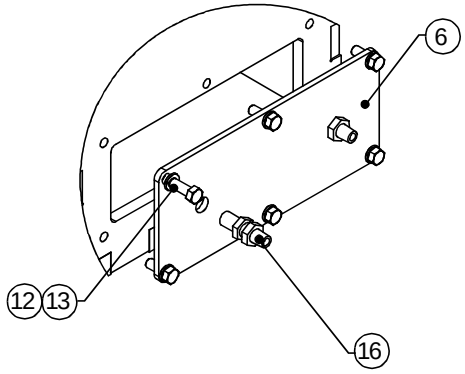
REF: P:\Manuals\Equip Manuals\Dwgs\CB2000-01\CB2010-01 S-A.wpg

Item #	Qty.	Part Number	Part Name
1	1	CB2001-01	HYDRAULIC JACK UPPER SECTION
2	2	CB2003	ALL THREAD WELDMENT
3	2	CB2004-01	SCALE FOR HYDRAULIC JACK
4	1	CB2005	CLEVIS PIN 1 1/4" x 6 1/2"
5	2	CB2006	ROLLER MOUNTING PLATE
6	1	CB2007	BULKHEAD PLATE
7	2	CB2008	HEAVY DUTY BALL TRANSFER UNIT
8	2	CB2011	FIXING CLIP FOR BALL TRANSFER UNIT
9	1	CB2014	CLEVIS PIN 1 1/4" x 7 5/8"
10	1	CB2022-01	HYDRAULIC JACK LOWER SECTION BOLT-ON
11	1	CB2023	CYLINDER 4" BORE 8" STROKE 2 1/4" ROD
12	14	1027	3/8" LOCKWASHER
13	14	1047	3/8"-16 x 1" HHCS
14	6	272	3/4"-16 JAM NUT
15	2	6009	HAIRPIN COTTER PIN 0.243 F/ 1 1/8" - 1 1/2" ROUND
16	2	6WFTX	MALE BULKHEAD CONNECTOR 37° FLARE/NPTF
17	1	BUC5524 ★	P.O. CHECK VALVE

★ NOT SHOWN







DETAIL A
SCALE 1 : 6

HYDRAULIC JACK/ROLLER SYSTEM

BOLT-ON ASSEMBLY

ASSEMBLY NO. CB2020-01

APPROX. WEIGHT (LBS) = 422

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REV. #	LOG #	DATE
		01/10/06

REF: P:\Manuals\Equip Manuals\Dwgs\CB2000-01\CB2020-01 B-O.wpg

SECTION 9 MOTOR SERVICE MANUALS

To request copy of Rineer Motor Service Manuals, please contact:

Superior Manufacturing & Hydraulics
4225 Hwy. 90 East
Broussard, LA 70518
Phone: 337-837-8847
Fax: 337-837-8839
www.superior-manf.com

Note: Some **CLINCHER®** Bucking Units feature Rineer Motors with two rotor sections to provide greater output torque. Please contact SUPERIOR Manufacturing & Hydraulics for additional information concerning these motors, spare parts, and replacement procedures.

AIR DRIVEN
HYDRAULIC PRESSURE INTENSIFIERS

These optional air driven hydraulic pressure intensifiers boost the hydraulic clamping pressure to levels greater than can be produced using your main hydraulic power unit.

Two intensifier systems are used in the unit. Each consists of a pump and preset pressure relief valve. One system is located within the tong section and the other located within the backup section of your bucking unit. The pumps are supplied with hydraulic oil from the low pressure (upstream) side of the pilot operated check valve. High pressure is returned to the high pressure (downstream) side of the pilot operated check valve (see schematic). Both intensifiers are remotely operated by means of two 1/4 turn air control ball valves located near your bucking unit's hydraulic directional control valves. These two ball valves control the air supply to each pump.

Haskle Pump: M-36 Series 1/3 hp pumps (maximum rated output 4,500 psi) using 10 CFM @ 125 psi for maximum pressure and flow rate performance.

Swagelok Pressure Relief Valve: SS-4R3A5-G with RED spring kit 177-R3A-K1-G for 4000 to 5000 psi cracking pressure.

OPERATING PROCEDURES

1. Check all fluid levels including diesel, engine oil, hydraulic oil, compressor oil (if applicable).
2. Drain all water from air dryer. Add oil to air lubricator.
3. Install correct dies in tong and backup sections.
4. Start electric or diesel hydraulic power unit, electrical generator and air compressor (as required for your system).
5. Determine clamping pressure requirement:
   a. For low torque/large diameter tubulars use only hydraulic power unit pressure.
   b. For moderate torque/smaller diameter tubulars use only hydraulic power unit pressure plus limited intensified pressures. Limited intensified pressures are controlled by reducing air supply pressure at air regulator.

   DO NOT ATTEMPT TO ADJUST SWAGELOK PRESSURE RELIEF VALVES. Failure to comply with this regulation may cause irreparable equipment damage and expose personnel to potentially fatal hazards.

   c. For high torque/small diameter tubulars use hydraulic power unit pressure plus maximum intensified pressure. Maximum intensified pressure is achieved by adjusting regulator to maximum air pressure setting.
6. Install tubular to be bucked up in bucking unit tong and backup.
   a. Actuate directional control valve to clamp backup. If intensified pressure is required, maintain directional control valve in clamped position and rotate backup intensifier air control valve to turn on air to actuate intensifier. Pump will actuate several times building pressure in clamping cylinders.

   DO NOT EXTEND CYLINDERS OR ACTUATE INTENSIFIERS UNLESS PIPE CORRECT DIES ARE INSTALLED IN THE BUCKING UNIT. Failure to comply will cause extensive equipment damage and expose personnel to dangerous high pressure hydraulic leaks.

   Note: The hydraulic system pressure gauge reading will not change as it is measuring pressure on low pressure side of pilot operated check valve. Note: Pump will continue to slowly cycle if air pressure setting allows pump to intensify pressure greater than the relief valve setting.
   Return air control valve to closed position. Release backup directional control valve.
   b. Actuate directional control valve to clamp tong. If intensified pressure is required, maintain directional control valve in clamped position and rotate tong intensifier air control valve to actuate intensifier. The pump will actuate several times building pressure in clamping cylinders.

   DO NOT EXTEND CYLINDERS OR ACTUATE INTENSIFIERS UNLESS PIPE CORRECT DIES ARE INSTALLED IN THE BUCKING UNIT. Failure to comply will cause extensive equipment damage and expose personnel to dangerous high pressure hydraulic leaks.

   Note: The hydraulic system pressure gauge reading will not change as it is measuring pressure on low pressure side of pilot operated check valve. Note: Pump will continue to slowly cycle if air pressure setting allows pump to intensify pressure greater than the relief valve setting.

   Return air control valve to closed position. Release tong directional control valve.
   c. Actuate tong make/break directional control valve as required.
   d. Release clamping cylinders in tong and backup using directional control valves.

SECTION 10 PUMP SERVICE MANUAL & TECHNICAL DATA

To request copy of Haskel Pump Technical Data, please contact:

Superior Manufacturing & Hydraulics
4225 Hwy. 90 East
Broussard, LA 70518
Phone: 337-837-8847
Fax: 337-837-8839
www.superior-manf.com

SECTION 11 HYDRAULIC POWER UNIT

PARTS LIST

PU7560 Electrically Driven Hydraulic Power Unit

1800 RPM, 60 HZ, 75 HP, 3 PH, 230/460 V, 60 GPM, 3,000 PSI Power Unit with Horse Power Limiting Load Sense

Description	*Manufacturer*	*Part Number*
Reservoir	Saint Mfg.	PU4060-S37
75 HP Electric Motor	Rexel	PU7560-S1
Pump/Motor Adapter	Magnalloy	PU2500-H16
Motor/Pump Coupling	Magnalloy	Motor – PU2500-H14
		Pump – PU2500H18
Motor/Pump Coupling Spider	Magnalloy	PU2500-H17
Suction Strainer	Schroeder	PU2500-H19
Hydraulic Pump	Vickers	PU4060-S20
Return Filter Cartridge Assembly	Schroeder	PU2500-H15
Pressure Filter Assembly	Schroeder	PU4060-S3
75 HP S/S Starter 480 VOL ACC 0275 HP3CPTPPLSS-480	Schroeder	PU7560-S32

Note: Standard industrial hydraulic system components including hydraulic hoses, pipe fittings, and low pressure suction isolation valve components are not specifically identified.

Note: This Power Unit features a piston pump system with a pressure compensator / horsepower limiting / load sense control. The pump will deliver a maximum of 60 gpm below pressures of 1000 psi. Above 1000 psi, the flow is decreased as not to overdraw the electric motor. (Example: 40 gpm @ 1500 psi) The maximum compensator setting is set to 2500 psi. The pump requires a load sense signal from the control valve to match the operating pressure with the load requirement. If there is no load requirement, the load sense signal will be "0" and the pump will be at a standby pressure (approximately 400-600 psi).

Hyd HP = (max flow (gpm) x max pressure (psi)) / 1714

SECTION 11 HYDRAULIC POWER UNIT

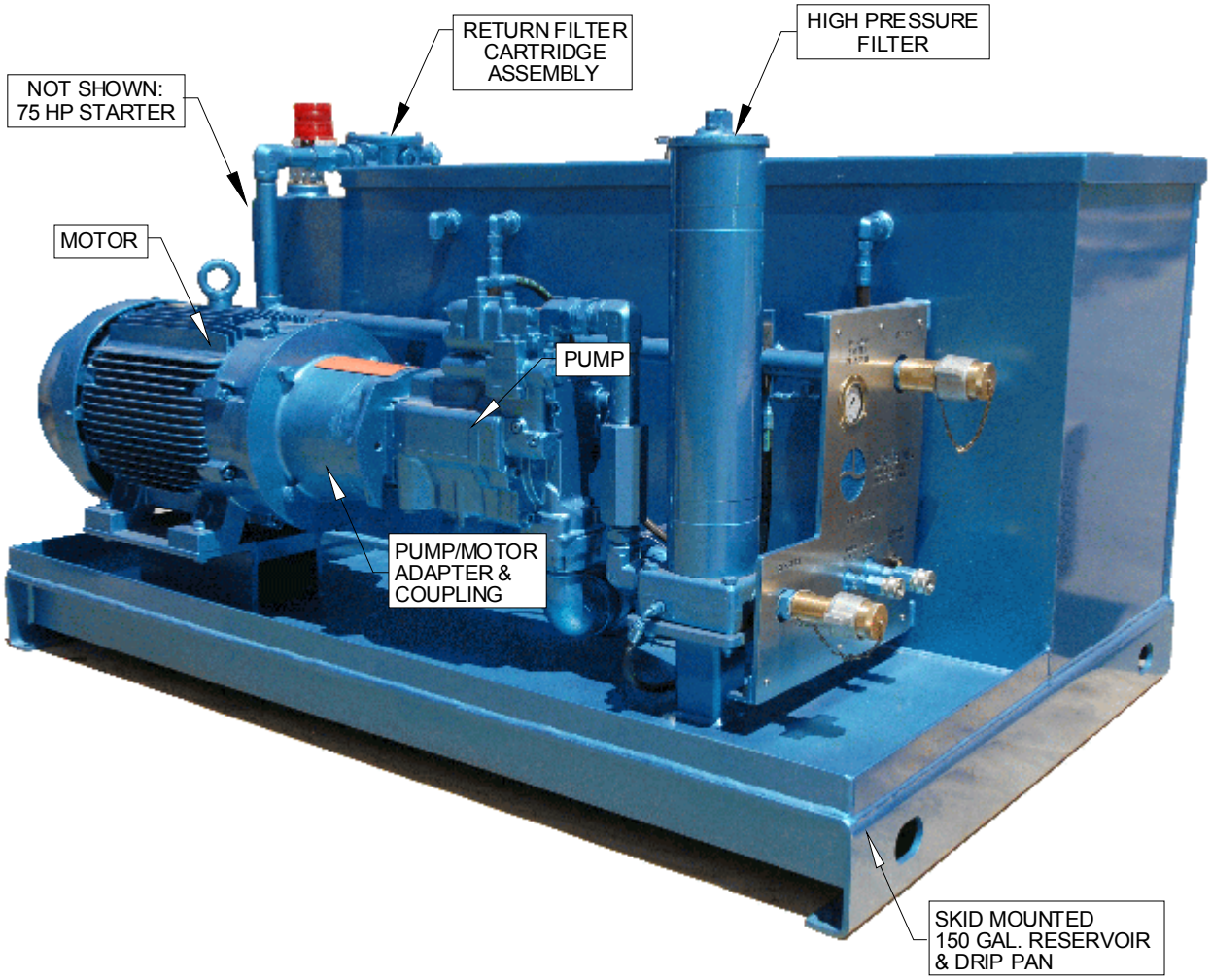
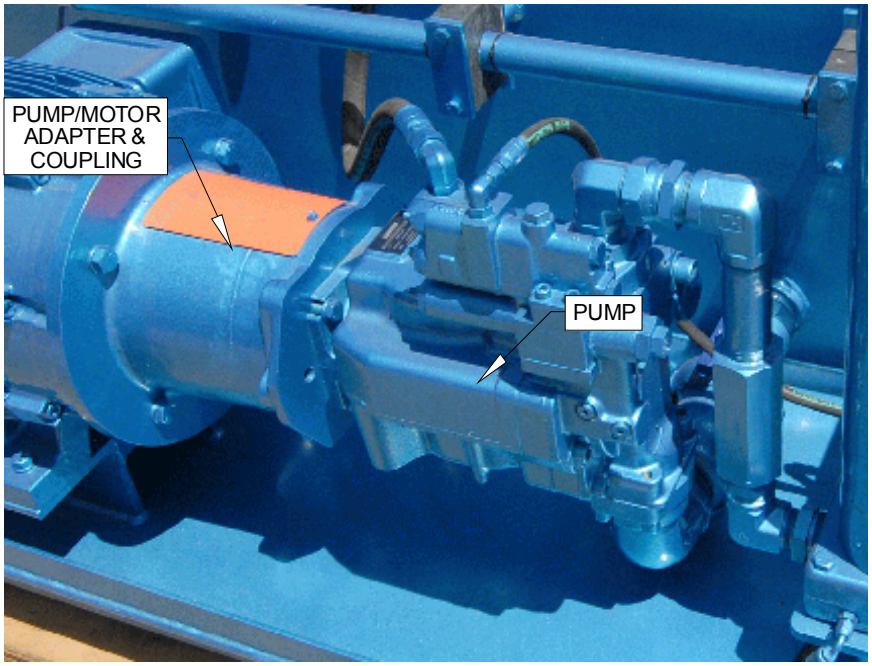


Photo 1

HYDRAULIC POWER UNIT

SECTION 11 HYDRAULIC POWER UNIT



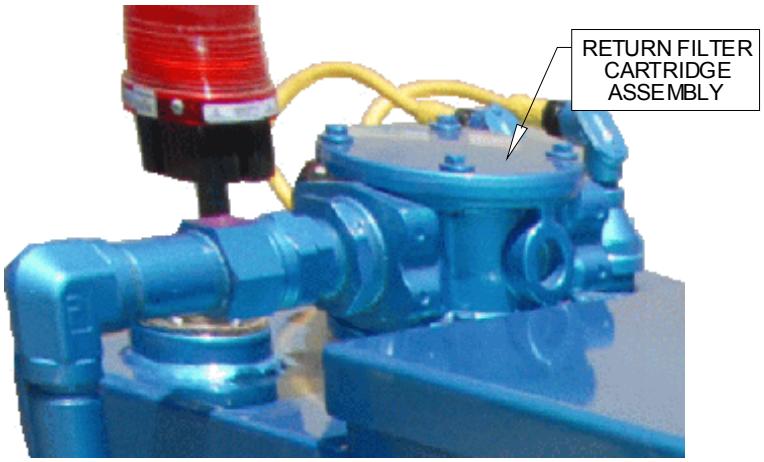
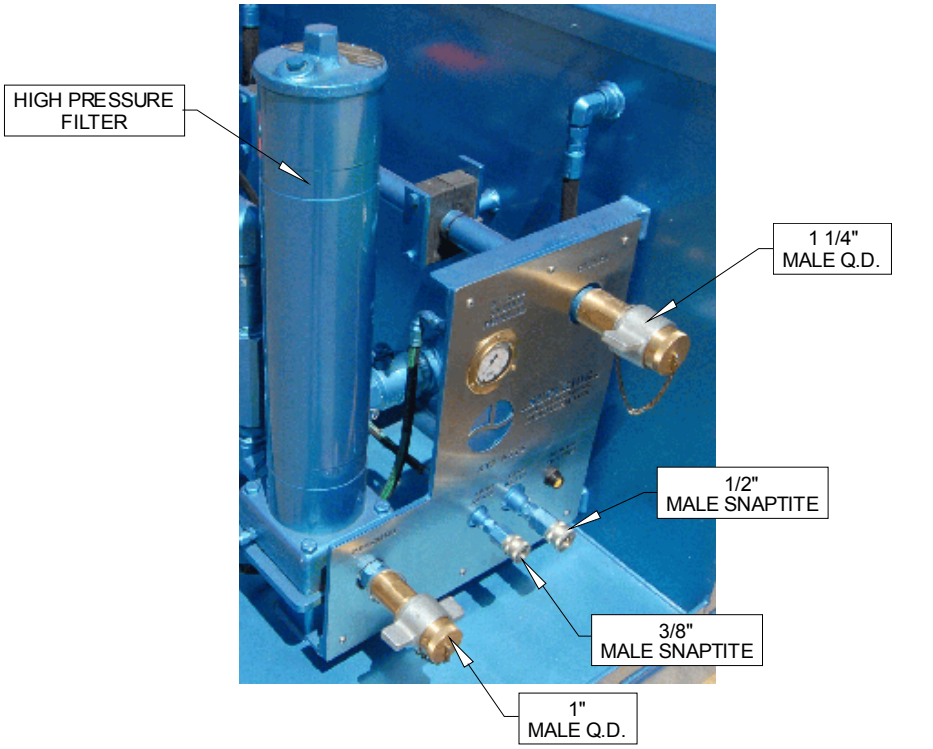


Photo 2
HYDRAULIC POWER UNIT COMPONENTS

SECTION 11 HYDRAULIC POWER UNIT



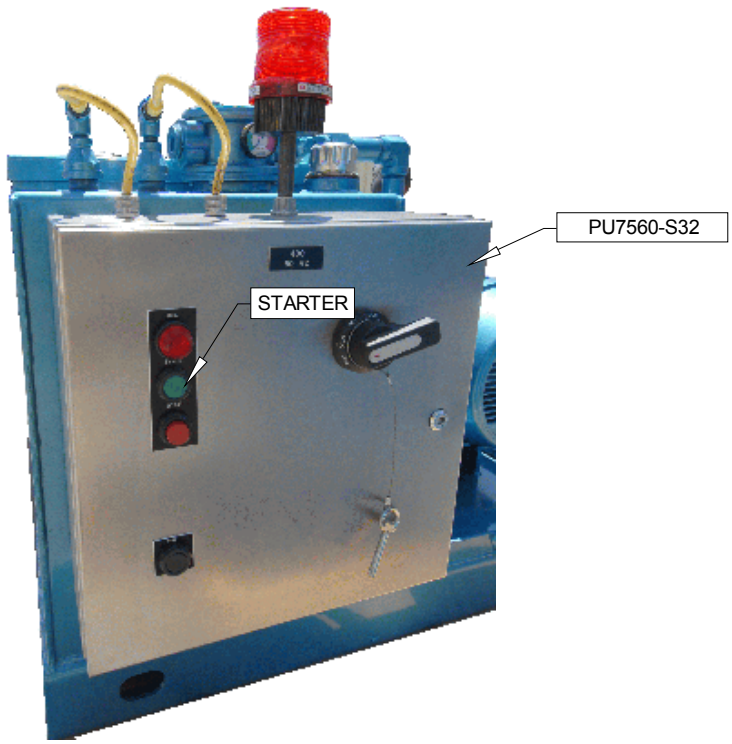
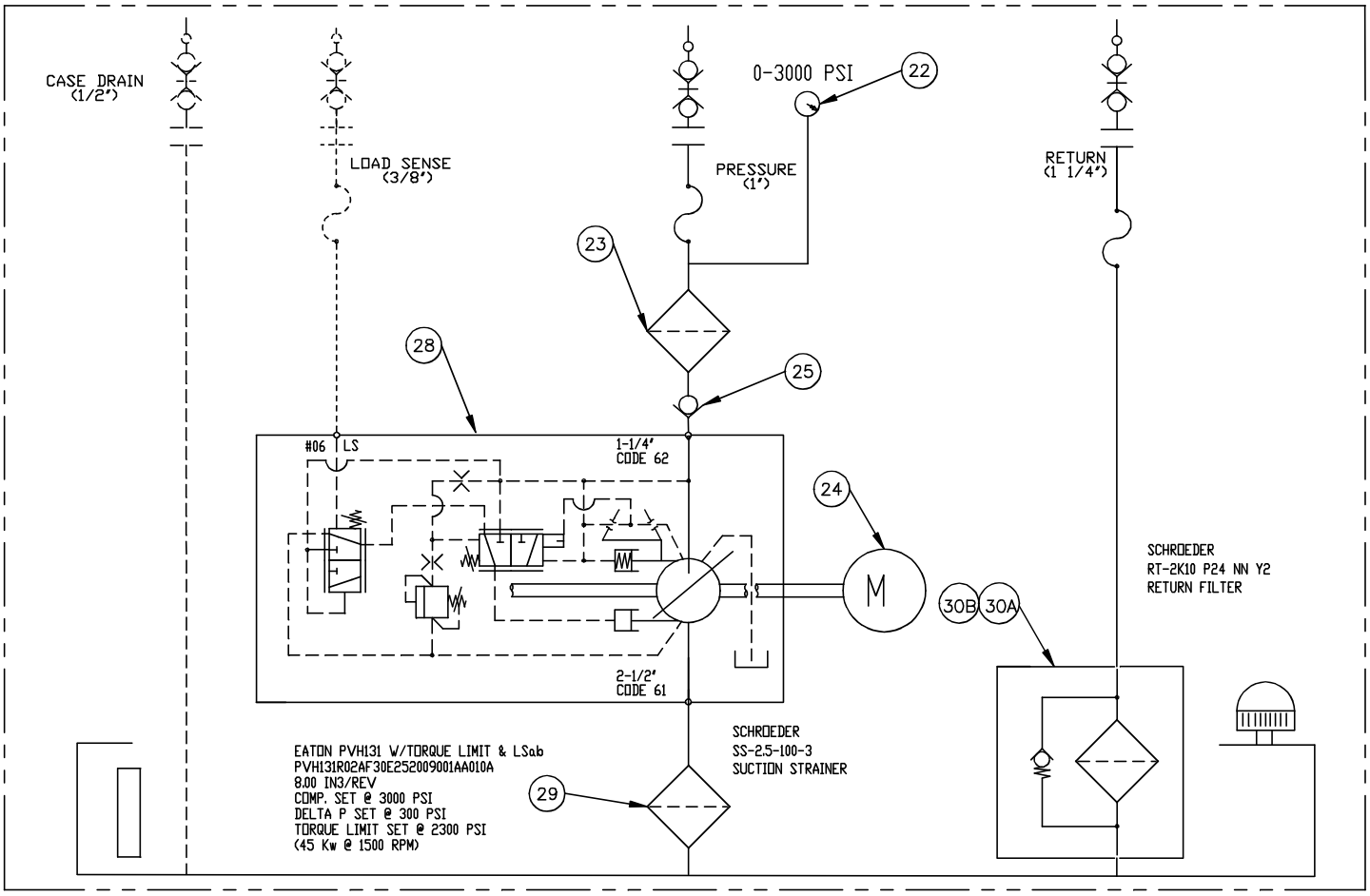


Photo 3
HYDRAULIC POWER UNIT COMPONENTS

Item	Qty.	Part Number	Description
22	1	BAC-3M25RCFF	PRESSURE GAUGE, 0-3000
23	1	PU4060-S3	HIGH PRESSURE FILTER
24	1	PU7560-S1	ELECTRIC MOTOR
25	1	PU2500-15	CHECK VALVE
28	2	PU4060-S20	HYDRAULIC PUMP
29	1	PU2500-H19	SUCTION STRAINER
30A	1	PU2500-H15	RETURN FILTER
30B	1	K3	REPLACEMENT CARTRIDGE



HYDRAULIC POWER UNIT SCHEMATIC

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